# Package 'colorscience'

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**Type** Package

**Title** Color Science Methods and Data

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**Maintainer** Glenn Davis <gdavis@gluonics.com>

**Description** Methods and data for color science - color conversions by observer, illuminant, and gamma. Color matching functions and chromaticity diagrams. Color indices, color differences, and spectral data conversion/analysis.

**License** GPL (>= 3)

**Depends** R (>= 2.10), Hmisc, pracma, sp

**Enhances** png

**LazyData** yes

**Author** Jose Gama [aut],
Glenn Davis [aut, cre]

**Repository** CRAN

**NeedsCompilation** no

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## R topics documented:

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`ASTM.D1925.YellownessIndex`

*ASTM D 1925 Yellowness Index for Plastics*

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## Description

`ASTM.D1925.YellownessIndex` was developed for the definition of the Yellowness of homogeneous, non-fluorescent, almost neutral-transparent, white-scattering or opaque plastics as they will be reviewed under daylight condition.

## Usage

```
ASTM.D1925.YellownessIndex(XYZmatrix)
```

## Arguments

| | |
|---|---|
| `XYZmatrix` | tri-stimulus values for the calculated for illuminant C |

## Author(s)

Jose Gama

## Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

## References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

## Examples

```
XYZ<-c(0.1146538, 0.08391198, 0.08222077)
ASTM.D1925.YellownessIndex(XYZ)
```

---

`ASTM.E313.Whiteness` *ASTM E313 Whiteness*

---

## Description

`ASTM.E313.Whiteness` ASTM E313 Whiteness.

## Usage

```
ASTM.E313.Whiteness(XYZmatrix)
```

## Arguments

| | |
|---|---|
| `XYZmatrix` | tri-stimulus values for the calculated for illuminant C |

## Author(s)

Jose Gama

## Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

## References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

## Examples

```
XYZ<-c(0.1146538, 0.08391198, 0.08222077)
ASTM.E313.Whiteness(XYZ)
```

## ASTM.E313.YellownessIndex *ASTM E313 Yellowness*

### Description

ASTM.E313.YellownessIndex ASTM E313 has successfully been used for a variety of white or near white materials.

### Usage

```
ASTM.E313.YellownessIndex(XYZmatrix)
```

### Arguments

| | |
|---|---|
| XYZmatrix | tri-stimulus values for the calculated for illuminant C |

### Author(s)

Jose Gama

### Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### Examples

```
XYZ<-c(0.1146538, 0.08391198, 0.08222077)
ASTM.E313.YellownessIndex(XYZ)
```

## Berger59.Whiteness *Berger (59) Whiteness*

### Description

Berger59.Whiteness formula was developed by A. Berger (formerly employee of Bayer AG, Germany and was presented in 1959.

### Usage

```
Berger59.Whiteness(xyYmatrix, illuminant = "C", observer = 2, RefWhite =
                 get("XYZperfectreflectingdiffuser", envir = environment()))
```

### Arguments

| | |
|---|---|
| xyYmatrix | CIE values for illuminant C |
| illuminant | illuminant |
| observer | observer |
| RefWhite | White Reference |

### Author(s)

Jose Gama

### Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
Berger59.Whiteness(xyY)
```

---

## BVR2XYZ *convert from BVR coordinates to XYZ temperature (Robertson)*

---

### Description

BVR2XYZ convert from BVR coordinates to XYZ.

### Usage

```
BVR2XYZ(BVRmatrix)
```

### Arguments

| | |
|---|---|
| BVRmatrix | BVR coordinates |

### Value

XYZ coordinates

### Author(s)

Jose Gama

### Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

### References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

---

## cccie31 *CIE (1931) 2-deg chromaticity coordinates*

---

### Description

cccie31 is a table with CIE (1931) 2-deg chromaticity coordinates.

### Usage

```
cccie31
```

### Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**x** x chromaticity coordinate

**y** y chromaticity coordinate

**z** z chromaticity coordinate

### Author(s)

Jose Gama

### Source

Commission Internationale de l'Eclairage Proceedings, 1931 Cambridge: Cambridge University Press.

### References

Commission Internationale de l'Eclairage Proceedings, 1931 Cambridge: Cambridge University Press.

## Examples

```
data(cccie31)
cccie31
```

---

cccie64 *CIE (1964) 10-deg chromaticity coordinates*

---

## Description

cccie64 is a table with CIE (1964) 10-deg chromaticity coordinates.

## Usage

```
cccie64
```

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**x** x chromaticity coordinate

**y** y chromaticity coordinate

**z** z chromaticity coordinate

## Author(s)

Jose Gama

## Source

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## References

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## Examples

```
data(cccie64)
cccie64
```

## CCT2XYZ *Convert CCT to XYZ*

### Description

CCT2XYZ Converts correlated color temperature (CCT) to CIE tristimulus XYZ.

### Usage

```
CCT2XYZ(CCTmatrix)
```

### Arguments

| | |
|---|---|
| CCTmatrix | CCT values |

### Value

CIE tristimulus XYZ

### Author(s)

Jose Gama

### Source

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com/

### References

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com/

### Examples

```
CCT2XYZ(c(0.310897, 0.306510, 74.613450))
```

## CentralsISCCNBS *Central notations for the revised ISCC-NBS*

### Description

CentralsISCCNBS is a table with Central notations for the revised ISCC-NBS Color-Name Blocks.

### Usage

```
CentralsISCCNBS
```

## Format

This data frame contains the following data:

**Number** notation number

**Name** notation name

**MunsellSpec** Munsell specification

## Author(s)

Glenn Davis

## References

Kelly, Kenneth Low, 1910 Central notations for the revised ISCC-NBS Color-Name Blocks Journal of Research of the National Bureau of Standards Research Paper 2911, Vol. 61 No. 5, November 1958

## Examples

```
data(CentralsISCCNBS)
CentralsISCCNBS
```

---

# CheckColorLookup *Check that the color block number is correct*

---

## Description

`CheckColorLookup` Checks that the color block number is correct.

## Usage

```
CheckColorLookup(DataISCCNBS)
```

## Arguments

| | |
|---|---|
| `DataISCCNBS` | data.frame with columns MunsellSpec and Number |

## Value

logic

## Author(s)

Glenn Davis

`ChromaticAdaptation` *Chromatic adaptation algorithms*

## Description

`ChromaticAdaptation` chromatic adaptation algorithms implemented as a linear transformation (XYZ Scaling, Bradford and Von Kries).

## Usage

```
ChromaticAdaptation
```

## Format

This array frame contains the following dimensions:

**1** rows transformation matrix 3x3

**2** columns transformation matrix 3x3

**3** linear transformation (XYZ Scaling, Bradford or Von Kries)

**4** transformation "direct" or "inverse"

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com/

## References

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com/

## Examples

```
data(ChromaticAdaptation)
ChromaticAdaptation
```

## chromaticity.diagram *Plot the chromaticity diagram*

### Description

chromaticity.diagram Plots the chromaticity diagram AKA "horse shoe".

### Usage

```
chromaticity.diagram(chromaticityCoordinates=get("cccie31", envir = environment()),
conversionFunction=NULL,...)
```

### Arguments

| | |
|---|---|
| chromaticityCoordinates | chromaticity coordinates |
| conversionFunction | optional function to perform the coordinate conversion |
| ... | optional parameters for the plot command |

### Value

none

### Author(s)

Jose Gama

### Examples

```
chromaticity.diagram()
xl<-yl<-0:1
chromaticity.diagram(xlim=xl,ylim=yl)
chromaticity.diagram(conversionFunction=CIE1931XYZ2CIE1976uv, xlim=xl,ylim=yl,
xlab="u'",ylab="v'")
```

## chromaticity.diagram.color *Plot the chromaticity diagram line with color*

### Description

chromaticity.diagram.color Plots the chromaticity diagram AKA "horse shoe", as a black line, a color line or a polygon.

### Usage

```
chromaticity.diagram.color(chromaticityCoordinates=get("cccie31", envir = environment()),
conversionFunction=NULL, granularity=10, ...)
```

### Arguments

| | |
|---|---|
| chromaticityCoordinates | chromaticity coordinates |
| conversionFunction | optional function to perform the coordinate conversion |
| granularity | granularity = number of calculated points |
| ... | optional parameters for the plot command |

### Value

none

### Author(s)

Jose Gama

### Examples

```
chromaticity.diagram.color()
xl<-yl<-0:1
chromaticity.diagram.color(xlim=xl,ylim=yl)
chromaticity.diagram.color(conversionFunction=CIE1931XYZ2CIE1976uv, xlim=xl,
ylim=yl,xlab="u'",ylab="v'")
```

---

## CIE.Whiteness *CIE Whiteness*

---

### Description

CIE.Whiteness The CIE Whiteness index is widely used in the industry for D65 for 2 or 10 deg observer.

### Usage

```
CIE.Whiteness(xyYmatrix, illuminant = "D65", observer = 2, RefWhite
                = get("XYZperfectreflectingdiffuser", envir = environment()))
```

### Arguments

| | |
|---|---|
| xyYmatrix | xyY data |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |

### Author(s)

Jose Gama

### Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
CIE.Whiteness(xyY)
```

---

## CIE1931xy2CIE1960uv *Convert CIE 1931 xy color space to CIE 1960 uv color space*

---

### Description

`CIE1931xy2CIE1960uv` Converts CIE 1931 xy color space to CIE 1960 uv color space.

### Usage

```
CIE1931xy2CIE1960uv(xymatrix)
```

### Arguments

| | |
|---|---|
| `xymatrix` | xy coordinates |

### Value

CIE 1960 uv coordinates

### Author(s)

Jose Gama

### Source

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## References

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## Examples

```
xyY <- cbind(0.4083308, 0.2988462, 0.08391198)
CIE1931xy2CIE1960uv(xyY)
```

---

`CIE1931xy2CIE1976uv` *Convert CIE 1931 xy color space to CIE 1976 uv color space*

---

## Description

`CIE1931xy2CIE1976uv` Converts CIE 1931 xy color space to CIE 1976 uv color space.

## Usage

```
CIE1931xy2CIE1976uv(xymatrix)
```

## Arguments

| | |
|---|---|
| `xymatrix` | xy coordinates |

## Value

CIE 1976 uv coordinates

## Author(s)

Jose Gama

## Source

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## References

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## Examples

```
xyY <- cbind(0.4083308, 0.2988462, 0.08391198)
CIE1931xy2CIE1976uv(xyY)
```

CIE1931XYZ2CIE1931xyz *Convert CIE 1931 XYZ color space to CIE 1931 xyz color space*

## Description

CIE1931XYZ2CIE1931xyz Converts CIE 1931 XYZ color space to CIE 1931 xyz color space.

## Usage

```
CIE1931XYZ2CIE1931xyz(XYZmatrix)
```

## Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |

## Value

CIE 1931 xyz coordinates

## Author(s)

Jose Gama

## Source

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## References

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
CIE1931XYZ2CIE1931xyz(XYZ)
```

CIE1931XYZ2CIE1960uv *Convert CIE 1931 XYZ color space to CIE 1960 uv color space*

## Description

CIE1931XYZ2CIE1960uv Converts CIE 1931 XYZ color space to CIE 1960 uv color space.

## Usage

```
CIE1931XYZ2CIE1960uv(XYZmatrix)
```

## Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |

## Value

CIE 1960 uv coordinates

## Author(s)

Jose Gama

## Source

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## References

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
CIE1931XYZ2CIE1960uv(XYZ)
```

CIE1931XYZ2CIE1976uv *Convert CIE 1931 XYZ color space to CIE 1976 uv color space*

## Description

CIE1931XYZ2CIE1976uv Converts CIE 1931 XYZ color space to CIE 1976 uv color space.

## Usage

```
CIE1931XYZ2CIE1976uv(XYZmatrix)
```

## Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |

## Value

CIE 1976 uv coordinates

## Author(s)

Jose Gama

## Source

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## References

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
CIE1931XYZ2CIE1976uv(XYZ)
```

CIE1960UCS2CIE1964 *Convert CIE 1960 UCS color space to CIE 1964 color space*

## Description

CIE1960UCS2CIE1964 Converts CIE 1960 UCS color space to CIE 1964 color space.

## Usage

```
CIE1960UCS2CIE1964(uvYmatrix, illuminant = "D65", observer = 2, RefWhite =
                 get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

| | |
|---|---|
| uvYmatrix | uvY data |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |

## Value

CIE 1976 uv coordinates

## Author(s)

Jose Gama

## Source

Wikipedia, 2014 CIE 1964 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## References

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## Examples

```
CIE1960UCS2CIE1964(c(0.1633789, 1.322222, 0.08391198))
```

CIE1960UCS2xy *Convert CIE 1960 UCS color space to 1960 xy color space*

## Description

CIE1960UCS2xy Converts CIE 1960 UCS color space to 1960 xy color space.

## Usage

```
CIE1960UCS2xy(uvMatrix)
```

## Arguments

| | |
|---|---|
| uvMatrix | uv coordinates |

## Value

CIE 1960 xy coordinates

## Author(s)

Jose Gama

## Source

Wikipedia, 2014 CIE 1964 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## References

Wikipedia, 2014 CIE 1931 color space http://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space

## Examples

```
CIE1960UCS2xy(c(0.1633789, 1.322222 ))
```

## CIE1976chroma *CIE 1976 chroma formula for CIELab and CIELuv*

### Description

CIE1976chroma CIE 1976 chroma formula for CIELab and CIELuv.

### Usage

```
CIE1976chroma(CIELMatrix)
```

### Arguments

| | |
|---|---|
| CIELMatrix | CIELab or CIELuv data |

### Author(s)

Jose Gama

### Source

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

### References

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

### Examples

```
CIELMatrix<-c(34.78467, 28.15159, 3.024663)
CIE1976chroma(CIELMatrix)
```

## CIE1976hueangle *CIE 1976 hue angle formula for CIELab and CIELuv*

### Description

CIE1976hueangle CIE 1976 hue angle formula for CIELab and CIELuv.

### Usage

```
CIE1976hueangle(CIELMatrix)
```

### Arguments

| | |
|---|---|
| CIELMatrix | CIELab or CIELuv data |

### Author(s)

Jose Gama

### Source

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

### References

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

### Examples

```
CIELMatrix<-c(34.78467, 28.15159, 3.024663)
CIE1976hueangle(CIELMatrix)
```

---

## CIE1976uv2CIE1931xy *CIE-1976 u'v' to CIE-1931 xy*

---

### Description

CIE1976uv2CIE1931xy CIE-1976 u'v' to CIE-1931 xy.

### Usage

```
CIE1976uv2CIE1931xy(uvmatrix)
```

### Arguments

| | |
|---|---|
| uvmatrix | CIE-1976 u'v' data |

### Author(s)

Jose Gama

### Source

Paul Schils, 2014 Color theory phenomena http://www.color-theory-phenomena.nl/10.03.htm

## References

Paul Schils, 2014 Color theory phenomena http://www.color-theory-phenomena.nl/10.03.htm

## Examples

```
CIE1976uv2CIE1931xy(c(0.2830965, 0.4661789))
```

---

`CIE1976uv2CIE1960uv` *CIE-1976 u'v' to CIE-1960 uv*

---

## Description

`CIE1976uv2CIE1960uv` CIE-1976 u'v' to CIE-1960 uv.

## Usage

```
CIE1976uv2CIE1960uv(uvmatrix)
```

## Arguments

| | |
|---|---|
| `uvmatrix` | CIE-1976 u'v' data |

## Author(s)

Jose Gama

## Source

Paul Schils, 2014 Color theory phenomena http://www.color-theory-phenomena.nl/10.03.htm

## References

Paul Schils, 2014 Color theory phenomena http://www.color-theory-phenomena.nl/10.03.htm

## Examples

```
CIE1976uv2CIE1960uv(c(0.2830965, 0.4661789))
```

CIE1976uvSaturation *CIE 1976 uv Saturation*

## Description

CIE1976uvSaturation CIE 1976 uv Saturation.

## Usage

```
CIE1976uvSaturation(uvMatrix, whitepoint)
```

## Arguments

| | |
|---|---|
| uvMatrix | CIELuv data |
| whitepoint | white point |

## Author(s)

Jose Gama

## Source

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

## References

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

## Examples

```
CIE1976uvSaturation(cbind(34.78467, 28.15159, 3.024663), as.numeric(
get("XYZperfectreflectingdiffuser",
envir = environment())[which(get("XYZperfectreflectingdiffuser",
envir = environment())[["Illuminant"]]=='C'),c('X2','Y2')]))
```

CIELabtoDIN99 *Conversion from CIELAB color space to DIN99 coordinates*

## Description

CIELabtoDIN99 Converts from CIELAB color space to DIN99 coordinates.

## Usage

```
CIELabtoDIN99(Lab)
```

## Arguments

| | |
|---|---|
| Lab | CIELAB |

## Value

DIN99

## Author(s)

Jose Gama

## Source

CIELAB to DIN99 coordinates, 2014 http://de.wikipedia.org/w/index.php?title=Diskussion:DIN99-Farbraum

## References

CIELAB to DIN99 coordinates, 2014 http://de.wikipedia.org/w/index.php?title=Diskussion:DIN99-Farbraum

## Examples

```
CIELabtoDIN99(c(0.310897, 0.306510, 74.613450))
```

## CIEluminanceY2NCSblackness *approximated NCS blackness s by the CIE luminance factor Y*

### Description

`CIEluminanceY2NCSblackness` approximated NCS blackness s by the CIE luminance factor Y.

### Usage

```
CIEluminanceY2NCSblackness(Y)
```

### Arguments

| | |
|---|---|
| `Y` | CIE values for illuminant C |

### Author(s)

Jose Gama

### Source

Hsien-Che Lee, 2005 Introduction to Color Imaging Science Cambridge University Press pp. 366

### References

Hsien-Che Lee, 2005 Introduction to Color Imaging Science Cambridge University Press pp. 366

### Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
CIEluminanceY2NCSblackness(xyY[3])
```

## CIETint *Tint indices: CIE Tint and ASTM E313 Tint*

### Description

`CIETint` Tint indices: CIE Tint and ASTM E313 Tint.

### Usage

```
CIETint(xymatrix,illuminant='D65',observer=2)
```

### Arguments

| | |
|---|---|
| xymatrix | matrix with xy data |
| illuminant | illuminant |
| observer | observer |

### Value

Tint

### Author(s)

Jose Gama

### Source

CIE, 2004 CIE Publication 15:2004, "Colorimetry" ASTM E313, "Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates"

### References

CIE, 2004 CIE Publication 15:2004, "Colorimetry" ASTM E313, "Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates"

### Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
CIETint(xyY)
```

---

## ciexyz31 *CIE 1931 2-deg, XYZ CMFs*

---

### Description

ciexyz31 is a table with CIE 1931 2-deg, XYZ color matching functions.

### Usage

```
ciexyz31
```

### Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**xbar** x CMF

**ybar** y CMF

**zbar** z CMF

## Author(s)

Jose Gama

## Source

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## References

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## Examples

```
data(ciexyz31)
ciexyz31
```

---

# ciexyz64 *CIE 1964 10-deg, XYZ CMFs*

---

## Description

`ciexyz64` is a table with CIE 1964 10-deg, XYZ color matching functions.

## Usage

```
ciexyz64
```

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**xbar** x CMF

**ybar** y CMF

**zbar** z CMF

## Author(s)

Jose Gama

## Source

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## References

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## Examples

```
data(ciexyz64)
ciexyz64
```

---

CMY2CMYK *Convert CMY coordinates to CMYK*

---

## Description

CMY2CMYK Converts CMY coordinates to CMYK.

## Usage

```
CMY2CMYK(CMYmatrix)
```

## Arguments

| | |
|---|---|
| CMYmatrix | CMY coordinates |

## Value

CMYK coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
CMY2CMYK(c(0.59072, 0.85570, 0.80283))
```

## CMY2RGB *Convert CMYK coordinates to RGB*

### Description

CMY2RGB Converts CMYK coordinates to RGB.

### Usage

```
CMY2RGB(CMYmatrix)
```

### Arguments

| | |
|---|---|
| CMYmatrix | CMY coordinates |

### Value

RGB coordinates

### Author(s)

Jose Gama

### Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### Examples

```
CMY2RGB(c(0.310897, 0.306510, 74.613450))
```

## CMYK2CMY *Convert CMYK coordinates to CMY*

### Description

CMYK2CMY Converts CMYK coordinates to CMY.

### Usage

```
CMYK2CMY(CMYKmatrix)
```

### Arguments

| | |
|---|---|
| CMYKmatrix | CMYK coordinates |

### Value

CMY coordinates

### Author(s)

Jose Gama

### Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### Examples

```
CMYK2CMY(c(.342, .768, .683, .378))
```

---

## ColorBlockFromMunsell *Get HVC, ISCC-NBS Number and ISCC-NBS Name from Munsell notation*

---

### Description

ColorBlockFromMunsell Get HVC, ISCC-NBS Number and ISCC-NBS Name from Munsell notation.

### Usage

```
ColorBlockFromMunsell(HVC)
```

### Arguments

| | |
|---|---|
| HVC | Munsell hue, value and chroma |

### Format

**HVC[1** ] Munsell hue, on the ASTM D1535 100 point circular scale. All values are valid.

**HVC[2** ] Munsell value, must be between 0 and 10

**HVC[3** ] Munsell chroma, must be non-negative

## Value

HVC, ISCC-NBS Number, ISCC-NBS Name

## Author(s)

Glenn Davis

---

`compuphaseDifferenceRGB` *compuphase Difference RGB*

---

## Description

`compuphaseDifferenceRGB` compuphase Difference RGB.

## Usage

```
compuphaseDifferenceRGB(RGB1, RGB2)
```

## Arguments

| | |
|---|---|
| `RGB1` | RGB color sample |
| `RGB2` | RGB color reference |

## Value

Delta E

## Author(s)

Jose Gama

## Source

Thiadmer Riemersma, 2012 CompuPhase http://www.compuphase.com/cmetric.htm

## References

Thiadmer Riemersma, 2012 CompuPhase http://www.compuphase.com/cmetric.htm

## Examples

```
compuphaseDifferenceRGB(c(124,63,78),c(241,65,78))
```

`conversionIlluminance` *Conversion Factors for Units of Illuminance*

## Description

`conversionIlluminance` is a table of conversion factors for units of Illuminance

## Usage

```
conversionIlluminance
```

## Format

This data frame contains the following columns:

**footcandles** foot-candles

**lux** lm/m2 = lux

**phot** phot

**milliphot** milliphot

**units** units

## Author(s)

Jose Gama

## Source

J. Meyer-Arendt, "Radiometry and Photometry: Units and Conversion Factors," Appl. Opt. 7, 2081-2081 (1968).

## References

J. Meyer-Arendt, "Radiometry and Photometry: Units and Conversion Factors," Appl. Opt. 7, 2081-2081 (1968).

## Examples

```
data(conversionIlluminance)
conversionIlluminance
```

`conversionLuminance` *Conversion Factors for Units of Luminance*

## Description

`conversionLuminance` is a table of conversion factors for units of Luminance

## Usage

```
conversionLuminance
```

## Format

This data frame contains the following columns:

**cd.m.2** cd/m^2 = nit

**cd.cm.2** cd/cm^2 = stilb

**cd.ft.2** cd/ft^2

**cd.in.2** cd/in^2

**apostilb** apostilb = blondel

**millilambert** millilambert

**footlambert** foot-lambert

## Author(s)

Jose Gama

## Source

J. Meyer-Arendt, "Radiometry and Photometry: Units and Conversion Factors," Appl. Opt. 7, 2081-2081 (1968).

## References

J. Meyer-Arendt, "Radiometry and Photometry: Units and Conversion Factors," Appl. Opt. 7, 2081-2081 (1968).

## Examples

```
data(conversionLuminance)
conversionLuminance
```

createIsoTempLinesTable *table of isotemperature lines for use with the Robertson Method*

## Description

createIsoTempLinesTable table of isotemperature lines for use with the Robertson Method (Robertson, 1968) to interpolate isotemperature lines from the CIE 1960 UCS.

## Usage

```
createIsoTempLinesTable(SPD=NA,CIETable = get("ciexyz31", envir = environment()),
TCS = get("TCSdata", envir = environment()))
```

## Arguments

| | |
|---|---|
| SPD | light source spd |
| CIETable | reference data values |
| TCS | spectral reflectance data of 14 color test samples for CRI |

## Value

Iso temperature lines table

## Author(s)

Jose Gama

## Source

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightsources/appendixb1.asp

## References

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightsources/appendixb1.asp

## Examples

```
# illuminant A
SPD = illuminants[1:51*2-1,c('wlnm','A')] # every 10 nm
isoTempLinesTable <- createIsoTempLinesTable(SPD)
```

`daylightcomponents` *daylight components*

## Description

`daylightcomponents` table with the mean relative spectral radiant power distribution and first two eigenvectors for the CIE method of calculating daylight.

## Format

This data frame contains the following columns:

**wlnm** wavelength in nm

**S0** mean relative spectral radiant power distribution

**S1** first eigenvector

**S2** second eigenvector

## Author(s)

Jose Gama

## Source

Wyszecki, G. and Stiles, W.S., 1982 Color Science: Concepts and Methods, Quantitative data and formulae. John Wiley & Sons.

## References

Wyszecki, G. and Stiles, W.S., 1982 Color Science: Concepts and Methods, Quantitative data and formulae. John Wiley & Sons.

## Examples

```
data(daylightcomponents)
str(daylightcomponents)
```

deltaE1976 *Delta E (CIE 1976)*

## Description

deltaE1976 The color difference Delta E (CIE 1976).

## Usage

```
deltaE1976(Lab1, Lab2)
```

## Arguments

| | |
|---|---|
| Lab1 | CIE Lab color sample |
| Lab2 | CIE Lab color reference |

## Value

Delta E

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com

## References

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com

## Examples

```
RGB1<-c(124,63,78)
RGB2<-c(95,213,184)
deltaE1976(RGB1,RGB2)
```

deltaE1994 *Delta E (CIE 1994)*

## Description

deltaE1994 The color difference Delta E (CIE 1994).

## Usage

```
deltaE1994(Lab1, Lab2, textiles = FALSE)
```

## Arguments

| | |
|---|---|
| Lab1 | CIE Lab color sample |
| Lab2 | CIE Lab color reference |
| textiles | boolean, TRUE = version for textiles |

## Value

Delta E

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com

## References

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com

## Examples

```
RGB1<-c(124,63,78)
RGB2<-c(95,213,184)
deltaE1994(RGB1,RGB2)
```

deltaE2000 *Delta E (CIE 2000)*

## Description

deltaE2000 The color difference Delta E (CIE 2000).

## Usage

```
deltaE2000(Lab1, Lab2)
```

## Arguments

| | |
|---|---|
| Lab1 | CIE Lab color sample |
| Lab2 | CIE Lab color reference |

## Value

Delta E

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com

## References

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com

## Examples

```
RGB1<-c(124,63,78)
RGB2<-c(95,213,184)
deltaE2000(RGB1,RGB2)
```

deltaECMC *Delta E CMC*

## Description

deltaECMC The color difference method of the Color Measurement Committee (the CMC) .

## Usage

```
deltaECMC(Lab1, Lab2, L, C)
```

## Arguments

| | |
|---|---|
| Lab1 | CIE Lab color sample |
| Lab2 | CIE Lab color reference |
| L | parameter L |
| C | parameter C |

## Value

Delta E

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com

## References

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com

## Examples

```
RGB1<-c(124,63,78)
RGB2<-c(95,213,184)
deltaECMC(RGB1,RGB2)
```

DeMarcoPokornySmith2degConeFundamentals1992 *DeMarco, Pokorny & Smith (1992) versions of the Smith-Pokorny 2-deg fundamentals*

## Description

DeMarcoPokornySmith2degConeFundamentals1992 DeMarco, Pokorny & Smith (1992) versions of the Smith-Pokorny 2-deg fundamentals based on the CIE Judd-Vos 2-deg CMFs.

## Usage

```
DeMarcoPokornySmith2degConeFundamentals1992
```

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

## Author(s)

Jose Gama

## Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## Examples

```
data(DeMarcoPokornySmith2degConeFundamentals1992)
DeMarcoPokornySmith2degConeFundamentals1992
```

DIN6167.YellownessIndex *CIE Whiteness*

## Description

DIN6167.YellownessIndex The CIE Whiteness index is widely used in the industry for D65 for 2 or 10 deg observer.

## Usage

```
DIN6167.YellownessIndex(XYZmatrix, illuminant = "C", observer = 2, RefWhite
                 = get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

| | |
|---|---|
| XYZmatrix | CIE values for illuminant C |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |

## Author(s)

Jose Gama

## Source

Scandinavian Pulp, paper and board, 2003 Basic equations for optical properties SCAN-G 5:03 Revised 2003

## References

Scandinavian Pulp, paper and board, 2003 Basic equations for optical properties SCAN-G 5:03 Revised 2003

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
DIN6167.YellownessIndex(XYZ)
```

DIN99toCIELab *Conversion from DIN99 coordinates to CIELAB color space*

## Description

DIN99toCIELab Conversion from DIN99 coordinates to CIELAB color space.

## Usage

```
DIN99toCIELab(Lab99o)
```

## Arguments

| | |
|---|---|
| Lab99o | Lab99o coordinates |

## Value

CIELAB coordinates

## Author(s)

Jose Gama

## Source

DIN99 coordinates to CIELAB color space http://de.wikipedia.org/w/index.php?title=Diskussion:DIN99-Farbraum

## References

DIN99 coordinates to CIELAB color space http://de.wikipedia.org/w/index.php?title=Diskussion:DIN99-Farbraum

## Examples

```
DIN99toCIELab(c(0.59072, 0.85570, 0.80283))
```

`dkl2dklCart` *converts between spherical and cartesian coordinates for DKL*

## Description

`dkl2dklCart` Converts DKL, from spherical coordinates to cartesian. `dklCart2rgb` Converts DKL, from cartesian to spherical coordinates.

## Usage

```
dkl2dklCart(dklMatrix)
```

## Arguments

| | |
|---|---|
| `dklMatrix` | DKL coordinates |

## Value

DKL coordinates

## Author(s)

Jose Gama

## Source

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

## References

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

## Examples

```
RGB<-c(124,63,78)
d <- rgb2dklCart(RGB)
dklCart2dkl(d)
dkl2dklCart(c(1.647176, 60.8308, 91.45825))
d
```

dkl2rgb *convert RGB to DKL*

## Description

dkl2rgb Converts DKL, spherical coords coordinates to sRGB. dklCart2rgb Converts DKL, cartesian coords coordinates to sRGB.

## Usage

```
dkl2rgb(dklMatrix, conversionMatrix = NA)
```

## Arguments

| | |
|---|---|
| dklMatrix | DKL coordinates |
| conversionMatrix | conversion matrix |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

## References

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

## Examples

```
dklC <- rgb2dklCart(c(54,75,121))
dklCart2dkl(dklC)
```

DominantWavelength *Converts xyY coordinates to wavelength*

## Description

DominantWavelength Converts xyY coordinates to wavelength.

## Usage

```
DominantWavelength(xyYmatrix, illuminant='D65',observer=2,
RefWhiteIllum=get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

| | |
|---|---|
| xyYmatrix | xyY matrix |
| illuminant | illuminant |
| observer | observer |
| RefWhiteIllum | Reference White |

## Value

Dominant Wavelength

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2013 http://www.brucelindbloom.com/index.html?ColorCalculator.html

## References

Bruce Justin Lindbloom, 2013 http://www.brucelindbloom.com/index.html?ColorCalculator.html

## Examples

```
DominantWavelength(c(0.59072, 0.85570, 0.80283))
```

`emittanceblackbodyPlanck` *emittance of a black body of temperature T at a given wavelength*

## Description

`emittanceblackbodyPlanck` emittance of a black body of temperature T at a given wavelength (in metres).

## Usage

```
emittanceblackbodyPlanck(wlnm, T)
```

## Arguments

| | |
|---|---|
| `wlnm` | wavelength in nm |
| `T` | temperature in Kelvin |

## Value

emittance

## Author(s)

Jose Gama

## Source

Planck's radiation law https://en.wikipedia.org/wiki/Planck%27s_law

## References

Planck's radiation law https://en.wikipedia.org/wiki/Planck%27s_law

## Examples

```
emittanceblackbodyPlanck(555,2000)
```

`footcandle2candela.steradian.sqmeter` *converts foot candle to candela steradian / square meter*

## Description

`footcandle2candela.steradian.sqmeter` converts foot candle to candela steradian / square meter [cd*sr/m^2].

## Usage

```
footcandle2candela.steradian.sqmeter(ftcl)
```

## Arguments

| | |
|---|---|
| `ftcl` | foot candle |

## Value

watts / square centimeter

## Author(s)

Jose Gama

## Source

Translators cafe http://www.translatorscafe.com/cafe/EN/units-converter/illumination

## References

Translators cafe http://www.translatorscafe.com/cafe/EN/units-converter/illumination

## Examples

```
footcandle2candela.steradian.sqmeter(5)
```

## footcandle2lux *convert foot candle to Lumens/lux*

### Description

`footcandle2lux` converts foot candle to Lumens/lux.

### Usage

```
footcandle2lux(ftcl)
```

### Arguments

| | |
|---|---|
| `ftcl` | foot candle |

### Value

Lumens/lux

### Author(s)

Jose Gama

### Source

Translators cafe http://www.translatorscafe.com/cafe/EN/units-converter/illumination

### References

Translators cafe http://www.translatorscafe.com/cafe/EN/units-converter/illumination

### Examples

```
footcandle2lux(5)
```

## footcandle2watt.sqcentimeter *converts foot candle to watts / square centimeter*

### Description

`footcandle2watt.sqcentimeter` converts foot candle to watts / square centimeter [w/cm^2] (at 555 nm) .

### Usage

```
footcandle2watt.sqcentimeter(ftcl)
```

### Arguments

| | |
|---|---|
| ftcl | foot candle |

### Value

watts / square centimeter

### Author(s)

Jose Gama

### Source

Translators cafe http://www.translatorscafe.com/cafe/EN/units-converter/illumination

### References

Translators cafe http://www.translatorscafe.com/cafe/EN/units-converter/illumination

### Examples

```
footcandle2watt.sqcentimeter(5)
```

---

## GanzGrieser.Tint *Ganz and Grieser Tint*

---

### Description

GanzGrieser.Tint Ganz Grieser Tint Method.

### Usage

```
GanzGrieser.Tint(xyYmatrix)
```

### Arguments

| | |
|---|---|
| xyYmatrix | CIE xyY values for illuminant C |

### Author(s)

Jose Gama

### Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

## References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

## Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
GanzGrieser.Tint(xyY)
```

---

# GanzGrieser.Whiteness *Ganz and Grieser Whiteness*

---

## Description

GanzGrieser.Whiteness Dr. E. Ganz (formerly employee of Ciba AG, Switzerland) and Mr.R. Griesser (formerly employee of J.R.Geigy) developed the Ganz Grieser Whiteness Method.

## Usage

```
GanzGrieser.Whiteness(xyYmatrix)
```

## Arguments

| | |
|---|---|
| xyYmatrix | CIE xyY values for illuminant C |

## Author(s)

Jose Gama

## Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

## References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

## Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
GanzGrieser.Whiteness(xyY)
```

heuristic.wlnm2RGB *Approximations from wavelengths to RGB*

## Description

heuristic.wlnm2RGB Approximations from wavelengths to RGB.

## Usage

```
heuristic.wlnm2RGB(wavelength, Gamma = 0.8, IntensityMax = 1)
```

## Arguments

| | |
|---|---|
| wavelength | wavelength data |
| Gamma | Gamma |
| IntensityMax | maximum intensity |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Dan Bruton's, 2004 http://www.midnightkite.com/color.html Earl F. Glynn 2006 Delphi conversion http://www.efg2.com/Lab/ScienceAndEngineering/Spectra.htm

## References

Dan Bruton's, 2004 http://www.midnightkite.com/color.html Earl F. Glynn 2006 Delphi conversion http://www.efg2.com/Lab/ScienceAndEngineering/Spectra.htm

## Examples

```
heuristic.wlnm2RGB(555)
```

HSL2RGB *Convert HSL coordinates to RGB*

## Description

HSL2RGB Converts HSL coordinates to RGB.

## Usage

```
HSL2RGB(HSLmatrix)
```

## Arguments

| | |
|---|---|
| HSLmatrix | HSL coordinates |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
HSL<-c(0.9590164, 0.3262032, 0.3666667)
HSL2RGB(HSL)
HSL2RGB(rbind(HSL,HSL,HSL,HSL,HSL))
```

HSV2RGB *Convert HSV coordinates to RGB*

## Description

HSV2RGB Converts HSV coordinates to RGB.

## Usage

```
HSV2RGB(HSVmatrix)
```

## Arguments

| | |
|---|---|
| HSVmatrix | HSV coordinates |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
HSV<-c(0.9590164, 0.4919355, 0.4862745)
HSV2RGB(HSV)
```

`Hue.2.RGB` *Convert Hue to RGB*

## Description

`Hue.2.RGB` Converts Hue to RGB for HSL conversion.

## Usage

```
Hue.2.RGB(v1, v2, vH)
```

## Arguments

| | |
|---|---|
| `v1` | value 1 |
| `v2` | value 2 |
| `vH` | value of hue |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

## References

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

## Examples

```
Hue.2.RGB(1,2,3)
```

## huedegree *convert Munsell hue to degree*

### Description

huedegree convert Munsell hue to degree.

### Usage

```
huedegree(MunIn)
```

### Arguments

| | |
|---|---|
| MunIn | Munsell hue color |

### Value

Munsell hue degree

### Author(s)

Jose Gama

### Source

Takahiro Onodera, 2010 Color-Model-Munsell-Util http://annocpan.org/dist/Color-Model-Munsell-Util

### References

Takahiro Onodera, 2010 Color-Model-Munsell-Util http://annocpan.org/dist/Color-Model-Munsell-Util

### Examples

```
huedegree('1P')
```

## huedegreemunsell *Table with Munsell hue degrees*

### Description

huedegreemunsell table with Munsell hue degrees.

### Usage

```
huedegreemunsell
```

### Format

This data frame contains the following columns:

**HueDegree** hue degree

**HueMunsell** hue in Munsell H

### Author(s)

Jose Gama

### Source

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

### References

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

### Examples

```
data(huedegreemunsell)
huedegreemunsell
```

---

## Hunter60.WhitenessIndex

*Hunter 60 Whiteness Index*

---

### Description

`Hunter60.WhitenessIndex` Hunter 60 Whiteness Index.

### Usage

```
Hunter60.WhitenessIndex(LabHunterMatrix)
```

### Arguments

LabHunterMatrix
: Lab Hunter values for illuminant C

### Author(s)

Jose Gama

### Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### Examples

```
HunterLab<-c(28.96756, 2.363884, 0.4821515)
Hunter60.WhitenessIndex(HunterLab)
```

---

## HunterLab2XYZ *Convert HunterLab coordinates to XYZ*

---

### Description

HunterLab2XYZ Converts HunterLab coordinates to XYZ.

### Usage

```
HunterLab2XYZ(HunterLabmatrix, illuminant = "D65", observer = 2,
           RefWhite = get("XYZperfectreflectingdiffuser", envir = environment()))
```

### Arguments

HunterLabmatrix
: HunterLab coordinates

illuminant
: illuminant

observer
: observer

RefWhite
: Reference White

### Value

XYZ coordinates

### Author(s)

Jose Gama

### Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### Examples

```
HunterLab2XYZ(c(0.310897, 0.306510, 74.613450))
```

---

## illuminantA — *Relative spectral power distributions of CIE illuminant A at 1 nm interval*

---

### Description

`illuminantA` is a table with Relative spectral power distributions of CIE illuminant A at 1 nm interval.

### Usage

```
illuminantA
```

### Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**intensity** Relative spectral power

### Author(s)

Jose Gama

### Source

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

### References

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## Examples

```
data(illuminantA)
illuminantA
```

---

`illuminantD65` *Relative spectral power distributions of CIE illuminant D65 at 1 nm interval*

---

## Description

`illuminantD65` is a table with Relative spectral power distributions of CIE illuminant D65 at 1 nm interval.

## Usage

```
illuminantD65
```

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**intensity** Relative spectral power

## Author(s)

Jose Gama

## Source

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## References

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## Examples

```
data(illuminantD65)
illuminantD65
```

`illuminants` *Relative spectral power distributions of CIE illuminants at 5 nm interval*

## Description

`illuminants` is a table with Relative spectral power distributions of CIE illuminants at 5 nm interval.

## Usage

```
illuminants
```

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**A** illuminant A

**B** illuminant B

**C** illuminant C

**D50** illuminant D50

**D55** illuminant D55

**D65** illuminant D65

**D75** illuminant D75

**D93** illuminant D93

**E** illuminant E

**Natural** illuminant Natural

**PlusWhite** illuminant PlusWhite

**TL84** illuminant TL84

**Polylux3000** illuminant Polylux3000

**Polylux4000** illuminant Polylux4000

**KolorRite** illuminant KolorRite

**FL1** illuminant FL1

**FL2** illuminant FL2

**FL3** illuminant FL3

**FL4** illuminant FL4

**FL5** illuminant FL5

**FL6** illuminant FL6

**FL7** illuminant FL7

**FL8** illuminant FL8

**FL9** illuminant FL9

**FL10** illuminant FL10

**FL11** illuminant FL11

**FL12** illuminant FL12

## Author(s)

Jose Gama

## Source

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## References

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

## Examples

```
data(illuminants)
illuminants
```

---

# ISObrightnessReflectometerRSD

*Weighting factors for the calculation of ISO brightness*

---

## Description

`ISObrightnessReflectometerRSD` is a table with the weighting factors for the calculation of ISO brightness.

## Usage

```
ISObrightnessReflectometerRSD
```

## Format

This data frame contains the following data:

**wln** wavelength

**F** factor

**weights** weight

### Author(s)

Jose Gama

### Source

Scandinavian Pulp, paper and board, 2003 Basic equations for optical properties SCAN-G 5:03 Revised 2003

### References

Scandinavian Pulp, paper and board, 2003 Basic equations for optical properties SCAN-G 5:03 Revised 2003

### Examples

```
data(ISObrightnessReflectometerRSD)
ISObrightnessReflectometerRSD
```

---

## kelvin2xy — *Blackbody radiator color temperature to CIE 1931 x,y chromaticity approximation function*

---

### Description

kelvin2xy Blackbody radiator color temperature to CIE 1931 x,y chromaticity approximation function.

### Usage

```
kelvin2xy(T)
```

### Arguments

| | |
|---|---|
| T | temperature in Kelvin |

### Value

color temperature

### Author(s)

Jose Gama

### Source

Kim et al., 2002 "Design of Advanced Color - Temperature Control System for HDTV Applications" http://fcam.garage.maemo.org/apiDocs/namespace_f_cam.html

## References

Kim et al., 2002 "Design of Advanced Color - Temperature Control System for HDTV Applications" http://fcam.garage.maemo.org/apiDocs/namespace_f_cam.html

## Examples

```
kelvin2xy(300)
```

---

Lab2LCHab *Convert CIE Lab coordinates to LCHab*

---

## Description

Lab2LCHab Converts CIE Lab coordinates to LCHab.

## Usage

```
Lab2LCHab(LabMatrix)
```

## Arguments

| | |
|---|---|
| LabMatrix | CIE Lab coordinates |

## Value

LCHab coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
Lab2LCHab(c(0.310897, 0.306510, 74.613450))
```

## LAB2LUV *Convert CIE Lab coordinates to CIE Luv*

### Description

LAB2LUV Converts CIE Lab coordinates to CIE Luv.

### Usage

```
LAB2LUV(Labmatrix)
```

### Arguments

| | |
|---|---|
| Labmatrix | CIE Lab coordinates |

### Value

XYZ coordinates

### Author(s)

Jose Gama

### Examples

```
LAB2LUV(c(0.310897, 0.306510, 74.613450))
```

## Lab2XYZ *Convert CIE Lab coordinates to XYZ*

### Description

Lab2XYZ Converts CIE Lab coordinates to XYZ.

### Usage

```
Lab2XYZ(Labmatrix, illuminant = "D65", observer = 2, RefWhite
                 = get("XYZperfectreflectingdiffuser", envir = environment()))
```

### Arguments

| | |
|---|---|
| Labmatrix | CIE Lab coordinates |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |

## Value

XYZ coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
Lab2XYZ(c(0.310897, 0.306510, 74.613450))
```

---

# LCHab2Lab *Convert LCHab coordinates to CIE Lab*

---

## Description

LCHab2Lab Converts LCHab coordinates to CIE Lab.

## Usage

```
LCHab2Lab(LCHabmatrix)
```

## Arguments

| | |
|---|---|
| LCHabmatrix | LCHab coordinates |

## Value

CIE Lab coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
LCHab2Lab(c(0.310897, 0.306510, 74.613450))
```

---

LCHuv2Luv *Convert LCHuv coordinates to CIE Luv*

---

## Description

LCHuv2Luv Converts LCHuv coordinates to CIE Luv.

## Usage

```
LCHuv2Luv(LCHuvmatrix)
```

## Arguments

| | |
|---|---|
| LCHuvmatrix | LCHuv coordinates |

## Value

CIE Luv coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
LCHuv2Luv(c(0.310897, 0.306510, 74.613450))
```

LEF2RGB *Convert LEF coordinates to RGB*

## Description

LEF2RGB Converts LEF coordinates to RGB.

## Usage

```
LEF2RGB(LEFmatrix)
```

## Arguments

| | |
|---|---|
| LEFmatrix | LEF coordinates |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Kang, Henry R, 2006 Computational color technology Spie Press Bellingham

## References

Kang, Henry R, 2006 Computational color technology Spie Press Bellingham

## Examples

```
LEF<-c(176.66667, 53.50000, -12.99038)
LEF2RGB(LEF)
```

LMS2DKL *Convert LMS coordinates to DKL*

## Description

LMS2DKL Converts LMS coordinates to DKL.

## Usage

```
LMS2DKL(bg, diffcone.coords, DKL2LMS = FALSE)
```

## Arguments

| | |
|---|---|
| bg | LMS coordinates |
| diffcone.coords | LMS coordinates |
| DKL2LMS | boolean, FALSE = DKL to LMS, TRUE = LMS to DKL |

## Value

DKL coordinates

## Author(s)

Jose Gama

## Source

David H. Brainard Cone Contrast and Opponent Modulation Color Spaces pp. 563 PART IV: CONE CONTRAST AND OPPONENT MODULATION COLOR SPACES

## References

David H. Brainard Cone Contrast and Opponent Modulation Color Spaces pp. 563 PART IV: CONE CONTRAST AND OPPONENT MODULATION COLOR SPACES

## Examples

```
#LMS<-c(3.822394, 10.17498, 1.130049)
#LMS2DKL(LMS)
```

LMS2RGB *Convert LMS coordinates to RGB*

## Description

LMS2RGB Converts LMS coordinates to RGB.

## Usage

```
LMS2RGB(LMSmatrix)
```

## Arguments

| | |
|---|---|
| LMSmatrix | LMS coordinates |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## References

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## Examples

```
LMS<-c(3.822394, 10.17498, 1.130049)
LMS2RGB(LMS)
```

LMS2XYZ *Convert LMS coordinates to XYZ*

## Description

LMS2XYZ Converts LMS coordinates to XYZ.

## Usage

```
LMS2XYZ(LMSmatrix)
```

## Arguments

| | |
|---|---|
| LMSmatrix | LMS coordinates |

## Value

XYZ coordinates

## Author(s)

Jose Gama

## Source

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## References

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## Examples

```
LMS<-c(3.822394, 10.17498, 1.130049)
LMS2XYZ(LMS)
```

LSLM2RGB *Convert LSLM coordinates to RGB*

## Description

LSLM2RGB Converts LSLM coordinates to RGB.

## Usage

```
LSLM2RGB(LSLMmatrix)
```

## Arguments

| | |
|---|---|
| LSLMmatrix | LSLM coordinates |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## References

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## Examples

```
LSLM<-c(-0.4186083, 0.007563981, 0.4918533)
LSLM2RGB(LSLM)
```

## LUV2LAB *Convert CIE Luv coordinates to CIE Lab*

### Description

LUV2LAB Converts CIE Luv coordinates to CIE Lab.

### Usage

```
LUV2LAB(Luvmatrix)
```

### Arguments

| | |
|---|---|
| Luvmatrix | Luv matrix |

### Value

XYZ coordinates

### Author(s)

Jose Gama

### Examples

```
LUV2LAB(c(0.310897, 0.306510, 74.613450))
```

## Luv2LCHuv *Convert CIE Luv coordinates to LCHuv*

### Description

Luv2LCHuv Converts CIE Luv coordinates to LCHuv.

### Usage

```
Luv2LCHuv(LuvMatrix)
```

### Arguments

| | |
|---|---|
| LuvMatrix | Luv coordinates |

### Value

LCHuv coordinates

### Author(s)

Jose Gama

### Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### Examples

```
Luv2LCHuv(c(0.310897, 0.306510, 74.613450))
```

---

## Luv2XYZ *Convert CIE Luv coordinates to XYZ*

---

### Description

Luv2XYZ Converts CIE Luv coordinates to XYZ.

### Usage

```
Luv2XYZ(Luvmatrix, illuminant = "D65", observer = 2, RefWhite
                  = get("XYZperfectreflectingdiffuser", envir = environment()))
```

### Arguments

| | |
|---|---|
| Luvmatrix | Luv matrix |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |

### Value

XYZ coordinates

### Author(s)

Jose Gama

### Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### Examples

```
Luv2XYZ(c(0.310897, 0.306510, 74.613450))
```

---

`Luv2Yuv` *Convert CIE Luv coordinates to Yuv*

---

### Description

`Luv2Yuv` Converts CIE Luv coordinates to Yuv.

### Usage

```
Luv2Yuv(Luvmatrix,illuminant='D65',observer=2,RefWhite=
get("XYZperfectreflectingdiffuser", envir = environment()))
```

### Arguments

| | |
|---|---|
| `Luvmatrix` | CIE Luv coordinates |
| `illuminant` | illuminant |
| `observer` | observer |
| `RefWhite` | Reference White |

### Value

Yuv coordinates

### Author(s)

Jose Gama

### Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### Examples

```
Luv2Yuv(c(0.310897, 0.306510, 74.613450))
```

`makeChromaticAdaptationMatrix` *Generate a Chromatic Adaptation matrix*

## Description

`makeChromaticAdaptationMatrix` Generates a Chromatic Adaptation matrix.

## Usage

```
makeChromaticAdaptationMatrix(ChromaticAdaptationAlgorithm = "VonKries",
                 illuminantSource = "C", illuminantDestination = "D65",
                 observer = 2, ChromaticAdaptationArray =
                 get("ChromaticAdaptation", envir = environment()),
 referenceWhiteArray = get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

| | |
|---|---|
| `ChromaticAdaptationAlgorithm` | Chromatic adaptation algorithm |
| `illuminantSource` | illuminant source |
| `illuminantDestination` | illuminant destination |
| `observer` | observer |
| `ChromaticAdaptationArray` | Chromatic adaptation array |
| `referenceWhiteArray` | reference white |

## Value

Chromatic Adaptation matrix

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

`MaterialReferenceData` *Material Reference Data from Principles of Digital Image Synthesis*

## Description

`MaterialReferenceData` Material Reference Data from Principles of Digital Image Synthesis, Appendix G Andrew S. Glassner 16 August 1994.

## Usage

```
MaterialReferenceData
```

## Format

This data frame contains the following data:

**wavelength** wavelength (nm)

**DarkSkin** spectra of: dark skin

**LightSkin** spectra of: light skin

**BlueSky** spectra of: blue sky

**Foliage** spectra of: foliage

**BlueFlower** spectra of: blue flower

**BluishGreen** spectra of: bluish green

**Orange** spectra of: orange

**PurplishBlue** spectra of: purplish blue

**ModerateRed** spectra of: moderate red

**Purple** spectra of: purple

**YellowGreen** spectra of: yellow green

**OrangeYellow** spectra of: orange yellow

**Blue** spectra of: blue

**Green** spectra of: green

**Red** spectra of: red

**Yellow** spectra of: yellow

**Magenta** spectra of: magenta

**Cyan** spectra of: cyan

**White** spectra of: white

**Neutral** spectra of: neutral

**Neutral6.5** spectra of: neutral 6.5

**Neutral5** spectra of: neutral 5

**Neutral3.5** spectra of: neutral 3.5

**Black** spectra of: black
**PineNeedles** spectra of: pine needles
**SilverMapleLeaf** spectra of: silver maple leaf
**DarkGreenMapleLeaf** spectra of: dark green maple leaf
**RedMapleLeaf** spectra of: red maple leaf
**Grass** spectra of: grass
**Soil** spectra of: soil
**VineLeaf** spectra of: vine leaf
**Alphalt** spectra of: alphalt
**DaisyWhitePetals** spectra of: daisy white petals
**DaisyYellowCenter** spectra of: daisy yellow center
**MarigoldOrange** spectra of: marigold orange
**MarigoldYellow** spectra of: marigold yellow
**DarkBlueJeans** spectra of: dark blue jeans
**FadedJeans** spectra of: faded jeans
**DarkBlueSweatPants** spectra of: dark blue sweat pants
**Denim** spectra of: denim
**WheatBread** spectra of: wheat bread
**WheatBreadCrust** spectra of: wheat bread crust
**Pancake** spectra of: pancake
**SwissArmyKnife** spectra of: swiss army knife
**PineWood** spectra of: pine wood
**MapleWood** spectra of: maple wood
**OakWood** spectra of: oak wood
**Bamboo** spectra of: bamboo
**Redwood** spectra of: redwood
**WalnutWood** spectra of: walnut wood
**YellowBanana** spectra of: yellow banana
**RipeBrownBanana** spectra of: ripe brown banana
**Cucumber** spectra of: cucumber
**CornKernel** spectra of: corn kernel
**CornHusk** spectra of: corn husk
**YellowDeliciousApple** spectra of: yellow delicious apple
**GreenPepper** spectra of: green pepper
**LemonSkin** spectra of: lemon skin
**Lettuce** spectra of: lettuce
**Carrot** spectra of: carrot
**BarleySeeds** spectra of: barley seeds
**LentilSeeds** spectra of: lentil seeds
**BrownRiceSeeds** spectra of: brown rice seeds
**Sand** spectra of: sand

### Author(s)

Jose Gama

### Source

Andrew S. Glassner, 1995 Principles of Digital Image Synthesis The Morgan Kaufmann Series in Computer Graphics and Geometric Modeling

### References

Andrew S. Glassner, 1995 Principles of Digital Image Synthesis The Morgan Kaufmann Series in Computer Graphics and Geometric Modeling

### Examples

```
data(MaterialReferenceData)
str(MaterialReferenceData)
```

---

## MaxChromaFromExtrapRenotationData

*Table with maximum chroma for which extrapolated renotation data is available*

---

### Description

`MaxChromaFromExtrapRenotationData` table with maximum chroma for which extrapolated renotation data is available.

### Usage

```
MaxChromaFromExtrapRenotationData
```

### Format

This data frame contains the following columns:

**H** Hue

**V** Value

**MaximumChroma** Maximum Chroma

### Author(s)

Jose Gama

### Source

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

### References

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

### Examples

```
data(MaxChromaFromExtrapRenotationData)
MaxChromaFromExtrapRenotationData
```

---

## MaxChromasForStandardMunsellHuesAndValues

*Table with maximum Munsell chroma, for a given Munsell hue and value, for which an extrapolated renotation value is available*

---

### Description

MaxChromasForStandardMunsellHuesAndValues table with maximum Munsell chroma, for a given Munsell hue and value, for which an extrapolated renotation value is available.

### Usage

```
MaxChromasForStandardMunsellHuesAndValues
```

### Format

This data frame contains the following columns:

**H** Hue

**V** Value

**MaximumChroma** Maximum Chroma (MacAdam limit)

### Author(s)

Jose Gama

### Source

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

### References

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

### Examples

```
data(MaxChromasForStandardMunsellHuesAndValues)
MaxChromasForStandardMunsellHuesAndValues
```

---

## Maxwell.triangle *Plot the Maxwell triangle*

---

### Description

`Maxwell.triangle` Plots the Maxwell triangle, as a black line, a color line or a polygon.

### Usage

```
Maxwell.triangle(primariesRGB=get("whitepointsRGB", envir = environment()),
conversionFunction=NULL,...)
```

### Arguments

| | |
|---|---|
| `primariesRGB` | primarie valuess for RGB color spaces |
| `conversionFunction` | optional function to perform the coordinate conversion |
| `...` | optional parameters for the plot command |

## Value

none

## Author(s)

Jose Gama

## Examples

```
Maxwell.triangle()
xl<-yl<-0:1
Maxwell.triangle(xlim=xl,ylim=yl)
Maxwell.triangle(conversionFunction=CIE1931XYZ2CIE1976uv,
xlim=xl,ylim=yl,xlab="u'",ylab="v'")
```

---

# Munsell100hues55 *Chromaticity diagram showing values for x and y for Illuminant A for 100 hues at 5/5*

---

## Description

`Munsell100hues55` Chromaticity diagram showing Tristimulus Values and Trilinear Coordinates for Illuminant A for 100 hues at 5/5.

## Usage

```
Munsell100hues55
```

## Format

This data frame contains the following columns:

**BookNotation** Munsell color notation from the Munsell book

**MunsellProductionNo**

**X** Tristimulus Value X

**Y** Tristimulus Value Y

**Z** Tristimulus Value Z

**x** Trilinear Coordinate x

**y** Trilinear Coordinate y

**z** Trilinear Coordinate z

## Author(s)

Jose Gama

### Source

Hermann VON Schelling, Dean Farnsworth, 1949 Trichromatic Specifications of the Munsell 100 Hues at 5/5 for Illuminant a Defense Technical Information Center NAVAL MEDICAL RESEARCH LAB NEW LONDON CONN.

### References

Hermann VON Schelling, Dean Farnsworth, 1949 Trichromatic Specifications of the Munsell 100 Hues at 5/5 for Illuminant a Defense Technical Information Center NAVAL MEDICAL RESEARCH LAB NEW LONDON CONN.

### Examples

```
data(Munsell100hues55)
Munsell100hues55
```

---

## Munsell100hues55FM100 *Munsell 100-Hues at 5/5, production numbers 101 to 200 and Farnsworth-Munsell 100 Hue test*

---

### Description

`Munsell100hues55FM100` Munsell 100-Hues at 5/5, production numbers 101 to 200 and Farnsworth-Munsell 100 Hue test.

### Usage

```
Munsell100hues55FM100
```

### Format

This data frame contains the following columns:

**FMtest** Farnsworth-Munsell 100 Hue test value

**MunsellNumber** Munsell 100-Hues at 5/5, production number

### Author(s)

Jose Gama

### Source

Hermann VON Schelling, Dean Farnsworth, 1949 Trichromatic Specifications of the Munsell 100 Hues at 5/5 for Illuminant a Defense Technical Information Center NAVAL MEDICAL RESEARCH LAB NEW LONDON CONN.

## References

Hermann VON Schelling, Dean Farnsworth, 1949 Trichromatic Specifications of the Munsell 100 Hues at 5/5 for Illuminant a Defense Technical Information Center NAVAL MEDICAL RESEARCH LAB NEW LONDON CONN.

## Examples

```
data(Munsell100hues55FM100)
Munsell100hues55FM100
```

---

`MunsellHues` *Table with Munsell Hues*

---

## Description

`MunsellHues` table with Munsell Hues.

## Usage

```
MunsellHues
```

## Author(s)

Jose Gama

## Source

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

## References

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

## Examples

```
data(MunsellHues)
MunsellHues
```

`MunsellNeutrals2sRGB` *Table with Munsell Neutrals and corresponding sRGB*

## Description

`MunsellNeutrals2sRGB` table with Munsell Neutrals and corresponding sRGB.

## Usage

```
MunsellNeutrals2sRGB
```

## Format

This data frame contains the following columns:

**MunsellNeutral** Munsell N

**R** sRGB R

**G** sRGB G

**B** sRGB B

## Author(s)

Jose Gama

## Source

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

## References

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox http://www.99main.com/~centore/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

## Examples

```
data(MunsellNeutrals2sRGB)
MunsellNeutrals2sRGB
```

## MunsellSpecToHVC *convert Munsell notation to numeric HVC*

### Description

MunsellSpecToHVC Converts convert Munsell notation to numeric Hue,Value,Chroma.

### Usage

```
MunsellSpecToHVC(MunsellSpecString)
```

### Arguments

| | |
|---|---|
| MunsellSpecString | string with the Munsell hue, value and chroma. |

### Value

numeric Hue,Value,Chroma

### Author(s)

Glenn Davis

## MunsellSpectral *Table with Munsell spectral data*

### Description

MunsellSpectral table for 1250 matt Munsell color chips with Munsell notation values, XYZ, xyY, RGB, CIE Lab, CIE Luv and spectral data.

### Usage

```
MunsellSpectral
```

### Author(s)

Jose Gama

### Source

Spectral Color Research group, 1989 University of Kuopio, Finland School of Computing and the Department of Physics and Mathematics Database - Munsell Colors Matt (AOTF) http://cs.joensuu.fi/~spectral/databases/download/munsell_aotf.htm

Parkkinen, J. P. S., Hallikainen, J. and Jaaskelainen, 1989 "Characteristic spectra of Munsell colors," Journal of the Optical Society of America Vol. 6, No. 2, February 1989, pp. 318-322.

## References

Spectral Color Research group, 1989 University of Kuopio, Finland School of Computing and the Department of Physics and Mathematics Database - Munsell Colors Matt (AOTF) http://cs.joensuu.fi/~spectral/databases/download/munsell_aotf.htm

Parkkinen, J. P. S., Hallikainen, J. and Jaaskelainen, 1989 "Characteristic spectra of Munsell colors," Journal of the Optical Society of America Vol. 6, No. 2, February 1989, pp. 318-322.

## Examples

```
## Not run:
data(MunsellSpectral)
MunsellSpectral

## End(Not run)
```

---

`MunsellV2relativeLuminanceY`

*Munsell value V to relative luminance Y*

---

## Description

`MunsellV2relativeLuminanceY` Munsell value V to relative luminance Y.

## Usage

```
MunsellV2relativeLuminanceY(V)
```

## Arguments

| | |
|---|---|
| `V` | Munsell value |

## Value

CIE XYZ "Y"

## Author(s)

Jose Gama

## Source

Mark D. Fairchild, 2013 Color Appearance Models, 3rd Ed. Wiley-IS&T

## References

Mark D. Fairchild, 2013 Color Appearance Models, 3rd Ed. Wiley-IS&T

## Examples

```
MunsellV2relativeLuminanceY(5)
```

---

`MunsellV2Y` *Munsell value to CIE XYZ "Y"*

---

## Description

`MunsellV2Y` Munsell value to CIE XYZ "Y" .

## Usage

```
MunsellV2Y(V)
```

## Arguments

| | |
|---|---|
| `V` | Munsell value |

## Value

CIE XYZ "Y"

## Author(s)

Jose Gama

## Source

ASTM, 2008 ASTM Standard D1535-08

## References

ASTM, 2008 ASTM Standard D1535-08

## Examples

```
MunsellV2Y(5)
```

NickersonColorDifference
*Nickerson Color Difference*

## Description

NickersonColorDifference Nickerson's Color Difference.

## Usage

```
NickersonColorDifference(MunsellHVC1, MunsellHVC2)
```

## Arguments

| | |
|---|---|
| MunsellHVC1 | Munsell HVC 1 |
| MunsellHVC2 | Munsell HVC 2 |

## Value

Delta E

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com

## References

Bruce Justin Lindbloom, 2013 Color Calculator http://www.brucelindbloom.com

## Examples

```
NickersonColorDifference('10B 5/6','5B 5/4')
```

PhotoYCC2RGB *Convert PhotoYCC to RGB*

## Description

PhotoYCC2RGB Converts PhotoYCC to RGB.

## Usage

```
PhotoYCC2RGB(PhotoYCCmatrix)
```

## Arguments

| | |
|---|---|
| PhotoYCCmatrix | PhotoYCC coordinates |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## References

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## Examples

```
p <- c(0.4560569, 155.9415709, 137.3026467)
PhotoYCC2RGB(p)
```

## PreucilAngle *Preucil Angle*

### Description

PreucilAngle Preucil Angle.

### Usage

```
PreucilAngle(RGBmatrix)
```

### Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

### Value

Angle

### Author(s)

Jose Gama

### Source

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

### References

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

### Examples

```
PreucilAngle(c(24,72,44))
```

## PreucilPercentGreyness *Preucil Percentage of Greyness*

### Description

PreucilPercentGreyness Preucil Percentage of Greyness.

### Usage

```
PreucilPercentGreyness(RGBmatrix)
```

### Arguments

RGBmatrix RGB coordinates

### Value

Percentage of Greyness

### Author(s)

Jose Gama

### Source

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

### References

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

### Examples

```
PreucilPercentGreyness(c(24,72,44))
```

---

## PreucilPercentHueError

*Preucil Percentage of Greyness*

---

### Description

PreucilPercentHueError Preucil Percentage of Hue Error.

### Usage

```
PreucilPercentHueError(RGBmatrix)
```

### Arguments

RGBmatrix RGB coordinates

### Value

Percentage of HueError

### Author(s)

Jose Gama

## Source

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

## References

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

## Examples

```
PreucilPercentHueError(c(24,72,44))
```

---

RGB2CMY *Convert sRGB coordinates to CMY*

---

## Description

RGB2CMY Converts sRGB coordinates to CMY.

## Usage

```
RGB2CMY(RGBmatrix)
```

## Arguments

| | |
|---|---|
| RGBmatrix | sRGB coordinates |

## Value

CMY coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
RGB2CMY(c(0.310897, 0.306510, 74.613450))
```

`rgb2dklV` *convert RGB to DKL*

## Description

`rgb2dklV` Converts sRGB coordinates to DKL, spherical coords, sames as Graph-Based Visual Saliency. `rgb2dklCart` Converts sRGB coordinates to DKL, cartesian coords.

## Usage

```
rgb2dklV(RGB)
```

## Arguments

| | |
|---|---|
| `RGB` | sRGB coordinates |

## Value

DKL coordinates

## Author(s)

Jose Gama

## Source

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

## References

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

## Examples

```
rgb2dklCart(c(54,75,121))
```

RGB2HSL *Convert RGB coordinates to HSL*

## Description

RGB2HSL Converts RGB coordinates to HSL.

## Usage

```
RGB2HSL(RGBmatrix)
```

## Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

## Value

HSL coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
RGB<-c(124,63,78)
RGB2HSL(RGB)
```

RGB2HSV *Convert RGB coordinates to HSV*

## Description

RGB2HSV Converts RGB coordinates to HSV.

## Usage

```
RGB2HSV(RGBmatrix)
```

## Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

## Value

HSV coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
RGB<-c(124,63,78)
RGB2HSV(RGB)
```

## RGB2hue *Convert sRGB coordinates to hue*

### Description

RGB2hue Converts sRGB coordinates to hue.

### Usage

```
RGB2hue(RGBmatrix)
```

### Arguments

| | |
|---|---|
| RGBmatrix | sRGB coordinates |

### Value

hue

### Author(s)

Jose Gama

### Examples

```
RGB2hue(c(0.310897, 0.306510, 74.613450))
```

## RGB2LEF *Convert RGB coordinates to LEF*

### Description

RGB2LEF Converts RGB coordinates to LEF.

### Usage

```
RGB2LEF(RGBmatrix)
```

### Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

### Value

LEF coordinates

### Author(s)

Jose Gama

### Source

Kang, Henry R, 2006 Computational color technology Spie Press Bellingham

### References

Kang, Henry R, 2006 Computational color technology Spie Press Bellingham

### Examples

```
RGB<-c(124,63,78)
RGB2LEF(RGB)
```

---

## RGB2LMS *Convert RGB coordinates to LMS*

---

### Description

RGB2LMS Converts RGB coordinates to LMS.

### Usage

```
RGB2LMS(RGBmatrix)
```

### Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

### Value

LMS coordinates

### Author(s)

Jose Gama

### Source

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

### References

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## Examples

```
RGB<-c(124,63,78)
RGB2LMS(RGB)
```

---

RGB2LSLM *Convert RGB coordinates to LSLM*

---

## Description

RGB2LSLM Converts RGB coordinates to LSLM.

## Usage

```
RGB2LSLM(RGBmatrix)
```

## Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

## Value

LSLM coordinates

## Author(s)

Jose Gama

## Source

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## References

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## Examples

```
RGB<-c(124,63,78)
RGB2LSLM(RGB)
```

RGB2PhotoYCC *Convert RGB coordinates to PhotoYCC*

## Description

RGB2PhotoYCC Converts RGB coordinates to PhotoYCC.

## Usage

```
RGB2PhotoYCC(RGBmatrix)
```

## Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

## Value

PhotoYCC coordinates

## Author(s)

Jose Gama

## Source

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## References

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## Examples

```
RGB<-c(124,63,78)
RGB2PhotoYCC(RGB)
```

RGB2XYZ *Convert sRGB coordinates to XYZ*

## Description

RGB2XYZ Converts sRGB coordinates to XYZ.

## Usage

```
RGB2XYZ(RGBmatrix, illuminant = "D65", observer = 2, RefWhite
                = get("XYZperfectreflectingdiffuser", envir = environment()),
                RGBModel = "sRGB", RefWhiteRGB = get("whitepointsRGB",
                envir =environment()), gamma = NA,
                RefWhiteIllum = get("XYZperfectreflectingdiffuser",
                envir = environment()), CAT = "Bradford",
                CATarray = get("ChromaticAdaptation", envir = environment()))
```

## Arguments

| | |
|---|---|
| RGBmatrix | sRGB coordinates |
| illuminant | illuminant |
| observer | observer |
| RefWhite | White Reference |
| RGBModel | RGB Model |
| RefWhiteRGB | White Reference RGB |
| gamma | gamma |
| RefWhiteIllum | White Reference illuminant |
| CAT | Chromatic Adaptation algorithm |
| CATarray | Chromatic Adaptation data |

## Value

CIE XYZ coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### Examples

```
RGB2XYZ(c(0.310897, 0.306510, 74.613450))
```

---

RGB2YCbCr *Convert RGB coordinates to YCbCr*

---

### Description

RGB2YCbCr Converts RGB coordinates to YCbCr.

### Usage

```
RGB2YCbCr(RGBmatrix)
```

### Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

### Value

YCbCr coordinates

### Author(s)

Jose Gama

### Source

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

### References

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

### Examples

```
RGB<-c(124,63,78)
RGB2YCbCr(RGB)
```

RGB2YIQ *Convert RGB coordinates to YIQ*

## Description

RGB2YIQ Converts RGB coordinates to YIQ.

## Usage

```
RGB2YIQ(RGBmatrix)
```

## Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

## Value

YIQ coordinates

## Author(s)

Jose Gama

## Source

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## References

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## Examples

```
RGB<-c(124,63,78)
RGB2YIQ(RGB)
```

RGB2YPbPr *Convert RGB coordinates to YPbPr*

## Description

RGB2YPbPr Converts RGB coordinates to YPbPr.

## Usage

```
RGB2YPbPr(RGBmatrix)
```

## Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

## Value

YPbPr coordinates

## Author(s)

Jose Gama

## Source

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## References

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## Examples

```
RGB<-c(124,63,78)
RGB2YPbPr(RGB)
```

RGB2YUV *Convert RGB coordinates to YUV*

## Description

RGB2YUV Converts RGB coordinates to YUV.

## Usage

```
RGB2YUV(RGBmatrix)
```

## Arguments

| | |
|---|---|
| RGBmatrix | RGB coordinates |

## Value

YUV coordinates

## Author(s)

Jose Gama

## Examples

```
RGB<-c(124,63,78)
RGB2YUV(RGB)
```

RxRyRz2XYZ *convert from three filter measurements (reflectance factors) to XYZ*

## Description

RxRyRz2XYZ convert from three filter measurements (reflectance factors) to XYZ.

## Usage

```
RxRyRz2XYZ(RxRyRzmatrix=NA,illuminant='C', observer=2,
RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

| | |
|---|---|
| RxRyRzmatrix | reflectance factors coordinates |
| illuminant | illuminant |
| observer | observer |
| RefWhite | White Reference |

## Value

CIE XYZ coordinates

## Author(s)

Jose Gama

## Examples

```
RxRyRz2XYZ(c(7.90393, 8.391198, 9.721126))
```

---

`saturationCIECAM02` *saturation CIECAM 2002*

---

## Description

`saturationCIECAM02` saturation CIECAM 2002.

## Usage

```
saturationCIECAM02(M, Q)
```

## Arguments

| | |
|---|---|
| `M` | colorfulness |
| `Q` | brightness |

## Value

saturation

## Author(s)

Jose Gama

## Source

Color by Wikipedians http://www.easyrgb.com/

## References

Color by Wikipedians http://www.easyrgb.com/

saturationCIELABEvaLubbe *CIELAB saturation (Eva Lubbe)*

## Description

saturationCIELABEvaLubbe CIELAB saturation (chroma normalized by lightness).

## Usage

```
saturationCIELABEvaLubbe(L,a,b)
```

## Arguments

| | |
|---|---|
| L | CIELAB L |
| a | CIELAB a |
| b | CIELAB b |

## Value

saturation

## Author(s)

Jose Gama

## Source

Color by Wikipedians http://www.easyrgb.com/

## References

Color by Wikipedians http://www.easyrgb.com/

## Examples

```
saturationCIELABEvaLubbe(34.78467, 28.15159, 3.024663)
```

## saturationCIELUV *CIELUV/CIELAB saturation*

### Description

saturationCIELUV CIELUV/CIELAB saturation.

### Usage

```
saturationCIELUV(u, v, un, vn)
```

### Arguments

| | |
|---|---|
| u | CIELAB u |
| v | CIELAB v |
| un | CIELAB u neutral |
| vn | CIELAB v neutral |

### Value

saturation

### Author(s)

Jose Gama

### Source

Color by Wikipedians http://www.easyrgb.com/

### References

Color by Wikipedians http://www.easyrgb.com/

## SmithPokorny2degConeFundamentals1975 *Smith & Pokorny (1975) 2-deg cone fundamentals*

### Description

SmithPokorny2degConeFundamentals1975 Smith & Pokorny (1975) 2-deg cone fundamentals based on the CIE Judd-Vos 2-deg CMFs.

### Usage

```
SmithPokorny2degConeFundamentals1975
```

### Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

### Author(s)

Jose Gama

### Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

### References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

### Examples

```
data(SmithPokorny2degConeFundamentals1975)
SmithPokorny2degConeFundamentals1975
```

---

## spectra2CCT *Correlated Color Temperature (CCT) from spectra*

---

### Description

`spectra2CCT` Correlated Color Temperature (CCT) from spectra.

### Usage

```
spectra2CCT(SPD=NA, isoTempLinesTable=NA,
CIETable = get("ciexyz31", envir = environment()), TCS = get("TCSdata",
envir = environment()))
```

### Arguments

| | |
|---|---|
| `SPD` | light source spd |
| `isoTempLinesTable` | Iso temperature lines table |
| `CIETable` | reference data values |
| `TCS` | spectral reflectance data of 14 color test samples for CRI |

## Value

Correlated Color Temperature (CCT)

## Author(s)

Jose Gama

## Source

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightsources/appendixb1.asp

## References

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightsources/appendixb1.asp

## Examples

```
# illuminant A
SPD = illuminants[1:51*2-1,c('wlnm','A')] # every 10 nm
CCT <- spectra2CCT(SPD)
CCT
```

---

`spectra2CRIGAIFSCI` *CRI, GAI and FSCI from spectra*

---

## Description

`spectra2CRIGAIFSCI` Color Rendering Index (CRI), Gamut Area Index (GAI) and full spectrum index (FSCI) from spectra.

## Usage

```
spectra2CRIGAIFSCI(SPD=NA, isoTempLinesTable=NA, CCT=NA,
CIETable = get("ciexyz31", envir = environment()), TCS = get("TCSdata",
envir = environment()))
```

## Arguments

| | |
|---|---|
| `SPD` | light source spd |
| `isoTempLinesTable` | Iso temperature lines table |
| `CCT` | Correlated Color Temperature (CCT) |
| `CIETable` | reference data values |
| `TCS` | spectral reflectance data of 14 color test samples for CRI |

### Value

CRI, GAI and FSCI

### Author(s)

Jose Gama

### Source

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightsources/appendixb1.asp

### References

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightsources/appendixb1.asp

### Examples

```
# illuminant A
## Not run:
SPD = illuminants[1:51*2-1,c('wlnm','A')] # every 10 nm
isoTempLinesTable <- createIsoTempLinesTable(SPD)
CCT <- spectra2CCT(SPD)
spectra2CRIGAIFSCI(SPD, isoTempLinesTable, CCT)
spectra2CRIGAIFSCI(SPD, isoTempLinesTable)
spectra2CRIGAIFSCI(SPD)

## End(Not run)
```

---

## spectra2ISObrightness *Diffuse blue reflectance factor (ISO brightness)*

---

### Description

spectra2ISObrightness Diffuse blue reflectance factor (ISO brightness), R457, ISO 2470.

### Usage

```
spectra2ISObrightness(spectraIn=NA, wlIn=NA,
RSDmatrix=get("ISObrightnessReflectometerRSD", envir = environment()))
```

### Arguments

| | |
|---|---|
| spectraIn | spectral data |
| wlIn | wavelength range |
| RSDmatrix | ISO brightness data |

## Value

LCHuv coordinates

## Author(s)

Jose Gama

## Source

ISO board, 2009 ISO 2470-1 : 2009 PAPER, BOARD AND PULPS MEASUREMENT OF DIFFUSE BLUE REFLECTANCE FACTOR PART 1 INDOOR DAYLIGHT CONDITIONS (ISO BRIGHTNESS)

## References

ISO board, 2009 ISO 2470-1 : 2009 PAPER, BOARD AND PULPS MEASUREMENT OF DIFFUSE BLUE REFLECTANCE FACTOR PART 1 INDOOR DAYLIGHT CONDITIONS (ISO BRIGHTNESS)

## Examples

```
spectra2ISObrightness(MaterialReferenceData[,c( 'BlueSky')],
MaterialReferenceData[,c('wavelength' )])
```

---

`spectra2lux` *Illuminance (Lux) from spectra*

---

## Description

`spectra2lux` Illuminance (Lux) from spectra.

## Usage

```
spectra2lux(spectraIn=NA, ciexyzIn=NA,wlIn=NA, wlInterval=NA)
```

## Arguments

| | |
|---|---|
| `spectraIn` | light source spd |
| `ciexyzIn` | reference data values |
| `wlIn` | range of output wavelengths |
| `wlInterval` | arbitrary wavelength interval to be applied to all series through interpolation |

## Value

Correlated Color Temperature (CCT)

### Author(s)

Jose Gama

### Source

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightsources/appendixb1.asp

### References

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightsources/appendixb1.asp

### Examples

```
spectra2lux(MaterialReferenceData[,c('wavelength','BlueSky')])
```

---

## spectra2XYZ *convert spectral data to tristimulus values*

---

### Description

spectra2XYZ convert spectral data to tristimulus values.

### Usage

```
spectra2XYZ(spectraIn=NA, illuminantIn=NA, ciexyzIn=NA,wlIn=NA, wlInterval=NA)
```

### Arguments

| | |
|---|---|
| spectraIn | spectral data |
| illuminantIn | illuminant |
| ciexyzIn | range of illuminant wavelengths |
| wlIn | range of spectral wavelengths |
| wlInterval | arbitrary wavelength interval to be applied to all series through interpolation |

### Value

XYZ coordinates

### Author(s)

Jose Gama

## Source

Andrew S. Glassner, 1995 Principles of digital image synthesis: Vol. 1 Kaufmann

## References

Andrew S. Glassner, 1995 Principles of digital image synthesis: Vol. 1 Kaufmann

## Examples

```
spectra2XYZ(MaterialReferenceData[,c('wavelength','BlueSky')])
```

---

# sprague *Interpolates an n by w matrix of spectra, sprague*

---

## Description

sprague Interpolates an n by w matrix of spectra, sprague.

## Usage

```
sprague(spectra, f)
```

## Arguments

| | |
|---|---|
| spectra | spectral data |
| f | range of wavelenghts |

## Value

Interpolated spectral data

## Author(s)

Jose Gama

## Source

Stephen Westland, 2014 http://www.mathworks.com/matlabcentral/fileexchange/40640-computational-colour-s
content/sprague.m

## References

Stephen Westland, 2014 http://www.mathworks.com/matlabcentral/fileexchange/40640-computational-colour-s
content/sprague.m

## StearnsStearnscorrection *Stearns and Stearns correction*

### Description

StearnsStearnscorrection Stearns and Stearns correction.

### Usage

```
StearnsStearnscorrection(P)
```

### Arguments

| | |
|---|---|
| P | XYZ coordinates |

### Value

RGB coordinates

### Author(s)

Jose Gama

### Source

Stephen Westland and Caterina Ripamonti, 2004 Computational Colour Science using MATLAB John Wiley & Sons Ltd, pp.35

### References

Stephen Westland and Caterina Ripamonti, 2004 Computational Colour Science using MATLAB John Wiley & Sons Ltd, pp.35

## Stensby68.Whiteness *Stensby Whiteness*

### Description

Stensby68.Whiteness formula was developed by Mr. P. Stensby (formerly employee of J.R. Geigy AG in US.)

### Usage

```
Stensby68.Whiteness(LabHunterMatrix)
```

### Arguments

`LabHunterMatrix`
: Lab Hunter values for illuminant C

### Author(s)

Jose Gama

### Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### Examples

```
Stensby68.Whiteness(c(0.310897, 0.306510, 74.613450))
```

---

## `StockmanMacLeodJohnson10degConeFundamentals1993`

*Stockman & Sharpe (2000) 10-deg cone fundamentals*

---

### Description

`StockmanMacLeodJohnson10degConeFundamentals1993` Stockman, MacLeod & Johnson (1993) 2-deg cone fundamentals based on the CIE 10-deg CMFs (adjusted to 2-deg).

### Usage

```
StockmanMacLeodJohnson10degConeFundamentals1993
```

### Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L10** L-cone spectral sensitivity, L10(lambda)

**M10** M-cone spectral sensitivity, M10(lambda)

**S10** S-cone spectral sensitivity, S10(lambda)

### Author(s)

Jose Gama

## Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## Examples

```
data(StockmanMacLeodJohnson10degConeFundamentals1993)
StockmanMacLeodJohnson10degConeFundamentals1993
```

---

# StockmanMacLeodJohnson2degCIEadjConeFundamentals1993

*Stockman, MacLeod & Johnson (1993) 2-deg cone fundamentals*

---

## Description

`StockmanMacLeodJohnson2degCIEadjConeFundamentals1993` Stockman, MacLeod & Johnson (1993) 2-deg cone fundamentals based on the CIE 10-deg CMFs (adjusted to 2-deg).

## Usage

```
StockmanMacLeodJohnson2degCIEadjConeFundamentals1993
```

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

## Author(s)

Jose Gama

## Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## Examples

```
data(StockmanMacLeodJohnson2degCIEadjConeFundamentals1993)
StockmanMacLeodJohnson2degCIEadjConeFundamentals1993
```

---

# StockmanMacLeodJohnson2degStilesBurchConeFundamentals1993

*Stockman, MacLeod & Johnson (1993) 2-deg fundamentals*

---

## Description

`StockmanMacLeodJohnson2degStilesBurchConeFundamentals1993` Stockman, MacLeod & Johnson (1993) 2-deg fundamentals based on the Stiles & Burch 2-deg CMFs.

## Usage

```
StockmanMacLeodJohnson2degStilesBurchConeFundamentals1993
```

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

## Author(s)

Jose Gama

## Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## Examples

```
data(StockmanMacLeodJohnson2degStilesBurchConeFundamentals1993)
StockmanMacLeodJohnson2degStilesBurchConeFundamentals1993
```

`StockmanSharpe10degCMFS2000` *Stockman & Sharpe (2000) 10-deg cone fundamentals*

## Description

`StockmanSharpe10degCMFS2000` Stockman & Sharpe (2000) 10-deg cone fundamentals based on the Stiles & Burch 10-deg CMFs linear 5nm.

## Usage

```
StockmanSharpe10degCMFS2000
```

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L10** L-cone spectral sensitivity, L10(lambda)

**M10** M-cone spectral sensitivity, M10(lambda)

**S10** S-cone spectral sensitivity, S10(lambda)

## Author(s)

Jose Gama

## Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## Examples

```
data(StockmanSharpe10degCMFS2000)
StockmanSharpe10degCMFS2000
```

`StockmanSharpe2degCMFadj2000`
*Stockman & Sharpe (2000) 2-deg cone fundamentals*

## Description

`StockmanSharpe2degCMFadj2000` Stockman & Sharpe (2000) 2-deg cone fundamentals based on the Stiles & Burch 10-deg CMFs (adjusted to 2-deg) linear 5nm.

## Usage

```
StockmanSharpe2degCMFadj2000
```

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

## Author(s)

Jose Gama

## Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## Examples

```
data(StockmanSharpe2degCMFadj2000)
StockmanSharpe2degCMFadj2000
```

SystemISCCNBS *ISCC-NBS System*

## Description

SystemISCCNBS is a table with the ISCC-NBS System data.

## Usage

```
SystemISCCNBS
```

## Format

This data frame contains the following data:

**HueInterval** interval of hues in the hue chart defining the elementary block

**Hmin** minimum ASTM D1535 Hue for the elementary block

**Hmax** maximum ASTM D1535 Hue for the elementary block

**Vmin** minimum Value for the elementary block

**Vmax** maximum Value for the elementary block

**Cmin** minimum Chroma for the elementary block

**Cmax** maximum Chroma for the elementary block. Cmax=Inf for some elementary blocks.

**Number** color number of the elementary block, from 1 to 267

## Author(s)

Glenn Davis

## References

Color : Universal Language and Dictionary of Names ISCC-NBS Method of Designating Colors and a Dictionary of Color Names Kelly, Kenneth Low Judd, Deane Brewster NBS Special Publication 440 December 1976 Section 13: Color Name Charts, pp. 16-31

## Examples

```
data(SystemISCCNBS)
SystemISCCNBS
```

Taube60.Whiteness *Taube Whiteness*

## Description

Taube60.Whiteness developed by Mr. Taube (formerly an employee of BASF AG, Germany). It was presented in 1960 and has found it's application mainly in the plastic sector.

## Usage

```
Taube60.Whiteness(XYZmatrix, illuminant = "D65", observer = 2, RefWhite
                  = get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

| | |
|---|---|
| XYZmatrix | CIE tristimulus values for illuminant C |
| illuminant | illuminant |
| observer | observer |
| RefWhite | White reference |

## Author(s)

Jose Gama

## Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

## References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
Taube60.Whiteness(XYZ)
```

TCSdata *The spectral reflectance data of 14 color test samples for CRI*

## Description

TCSdata is a table with the spectral reflectance data of 14 color test samples for CRI.

## Usage

```
TCSdata
```

## Format

This data frame contains the following data:

**wavelength** wavelength (nm)

**TCS1** spectral reflectance data for sample 1

**TCS2** spectral reflectance data for sample 2

**TCS3** spectral reflectance data for sample 3

**TCS4** spectral reflectance data for sample 4

**TCS5** spectral reflectance data for sample 5

**TCS6** spectral reflectance data for sample 6

**TCS7** spectral reflectance data for sample 7

**TCS8** spectral reflectance data for sample 8

**TCS9** spectral reflectance data for sample 9

**TCS10** spectral reflectance data for sample 10

**TCS11** spectral reflectance data for sample 11

**TCS12** spectral reflectance data for sample 12

**TCS13** spectral reflectance data for sample 13

**TCS14** spectral reflectance data for sample 14

## Author(s)

Jose Gama

## Source

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightsources/appendixb1.asp

## References

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightsources/appendixb1.asp

## Examples

```
data(TCSdata)
TCSdata
```

---

`tristimulusMunsell` *434 Munsell colors with tristimulus and CMFs for a few illuminants*

---

## Description

`tristimulusMunsell` is a table with 434 Munsell colors with tristimulus and Color matching functions for illuminants A, C D and S.

## Usage

```
tristimulusMunsell
```

## Format

This data frame contains the following data:

**Munsell** Munsell color notation

**X.A** tristimulus X for illuminant A

**Y.A** tristimulus Y for illuminant A

**Z.A** tristimulus Z for illuminant A

**x.A** CMF x for illuminant A

**y.A** CMF y for illuminant A

**X.C** tristimulus X for illuminant C

**Y.C** tristimulus Y for illuminant C

**Z.C** tristimulus Z for illuminant C

**x.C** CMF x for illuminant C

**y.C** CMF y for illuminant C

**X.D** tristimulus X for illuminant D

**Y.D** tristimulus Y for illuminant D

**Z.D** tristimulus Z for illuminant D

**x.D** CMF x for illuminant D

**y.D** CMF y for illuminant D

**X.S** tristimulus for X illuminant S

**Y.S** tristimulus for Y illuminant S

**Z.S** tristimulus for Z illuminant S

**x.S** CMF x for illuminant S

**y.S** CMF y for illuminant S

**X** Munsell painting number

## Author(s)

Jose Gama

## Source

K. L. Kelley, K. S. Gibson, and D. Nickerson, 1943 "Tristimulus specification of the Munsell Book of Color from spectrophotometric measurements," J. Opt. Soc. Am. 33, 355–376

## References

K. L. Kelley, K. S. Gibson, and D. Nickerson, 1943 "Tristimulus specification of the Munsell Book of Color from spectrophotometric measurements," J. Opt. Soc. Am. 33, 355–376

## Examples

```
data(tristimulusMunsell)
tristimulusMunsell
```

---

# VosEstevezWalraven2degConeFundamentals1990

*Vos, Estévez & Walraven (1990) 2-deg cone fundamentals*

---

## Description

`VosEstevezWalraven2degConeFundamentals1990` Vos, Estévez & Walraven (1990) 2-deg fundamentals based on the Stiles & Burch 2-deg CMFs.

## Usage

```
VosEstevezWalraven2degConeFundamentals1990
```

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

### Author(s)

Jose Gama

### Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

### References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

### Examples

```
data(VosEstevezWalraven2degConeFundamentals1990)
VosEstevezWalraven2degConeFundamentals1990
```

---

## VosWalraven2degConeFundamentals1971

*Vos & Walraven(1971) 2-deg cone fundamentals*

---

### Description

`VosWalraven2degConeFundamentals1971` Vos & Walraven(1971) 2-deg cone fundamentals based on the CIE Judd-Vos 2-deg CMFs.

### Usage

```
VosWalraven2degConeFundamentals1971
```

### Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

### Author(s)

Jose Gama

### Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

## Examples

```
data(VosWalraven2degConeFundamentals1971)
VosWalraven2degConeFundamentals1971
```

---

`WestlandBlacknessIndex`

*Westland, et al. blackness index*

---

## Description

`WestlandBlacknessIndex` (Westland, et al., 2006) blackness index.

## Usage

```
WestlandBlacknessIndex(CIELabMatrix)
```

## Arguments

| | |
|---|---|
| `CIELabMatrix` | CIELab coordinates |

## Value

blackness index

## Author(s)

Jose Gama

## Source

Westland, S.; Cheung, T. L. V.; Lozman, O. R., 2006. A metric for predicting perceptual blackness. 14th Color Imaging Conference Final Program and Proceedings, 14-17.

## References

Westland, S.; Cheung, T. L. V.; Lozman, O. R., 2006. A metric for predicting perceptual blackness. 14th Color Imaging Conference Final Program and Proceedings, 14-17.

## Examples

```
CIELab<-c(34.78467, 28.15159, 3.024663)
WestlandBlacknessIndex(CIELab)
```

`whitepointsilluminants` *White points of standard illuminants*

## Description

`whitepointsilluminants` is a table with White points of standard illuminants.

## Usage

```
whitepointsilluminants
```

## Format

This data frame contains the following data:

**illuminant** illuminant

**description** description

**x2** x2

**y2** y2

**x10** x10

**y10** y10

**CCT** CCT

## Author(s)

Jose Gama

## Source

Wikipedia, 2014 White points of standard illuminants http://en.wikipedia.org/wiki/Standard_illuminant

## References

Wikipedia, 2014 White points of standard illuminants http://en.wikipedia.org/wiki/Standard_illuminant

## Examples

```
data(whitepointsilluminants)
whitepointsilluminants
```

`whitepointsRGB` *Primaries for RGB color spaces*

## Description

`whitepointsRGB` is a table with primaries for RGB color spaces.

## Usage

```
whitepointsRGB
```

## Format

This data frame contains the following data:

**xRed** Primary red x

**yRed** Primary red y

**xGreen** Primary green x

**yGreen** Primary green y

**xBlue** Primary blue x

**yBlue** Primary blue y

**whitepointilluminant** illuminant

**gamma** gamma

**description** Color space name

## Author(s)

Jose Gama

## Source

Wikipedia, 2014 RGB color space http://en.wikipedia.org/wiki/RGB_color_space

## References

Wikipedia, 2014 RGB color space http://en.wikipedia.org/wiki/RGB_color_space

## Examples

```
data(whitepointsRGB)
whitepointsRGB
```

## wlnm2XYZ *Approximates wavelength to CIE tristimulus XYZ*

### Description

wlnm2XYZ Approximates wavelength to CIE tristimulus XYZ, by interpolation.

wlnm2xyz Approximates wavelength to CIE xyz, by interpolation.

### Usage

```
wlnm2XYZ(wavelength)
```

### Arguments

| | |
|---|---|
| wavelength | wavelength |

### Value

CIE XYZ

### Author(s)

Jose Gama

### Examples

```
wlnm2XYZ(555)
```

## xFit_1931 *Approximations from wavelengths to XYZ by Wyman et al*

### Description

xFit_1931 Approximations from wavelengths to XYZ by Wyman et al.

### Usage

```
xFit_1931(wave)
```

### Arguments

| | |
|---|---|
| wave | wavelenght data |

### Value

XYZ X, Y or Z coordinate

### Author(s)

Jose Gama

### Source

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

### References

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

### Examples

```
xFit_1931(555)
yFit_1931(555)
zFit_1931(555)
```

---

## xy2CCT.HernandezAndres

*convert from chromaticity coordinates to correlated color temperature (Hernandez Andres)*

---

### Description

`xy2CCT.HernandezAndres` convert from chromaticity coordinates to correlated color temperature (approximation) by Hernandez Andres.

### Usage

```
xy2CCT.HernandezAndres(x,y)
```

### Arguments

| | |
|---|---|
| x | x coordinates |
| y | y coordinates |

### Value

CCT (Hernandez Andres)

### Author(s)

Jose Gama

## Source

Hernandez-Andres, et al. 1999 "Calculating correlated color temperatures across the entire gamut of daylight and skylight chromaticities" http://en.wikipedia.org/wiki/Color_temperature

## References

Hernandez-Andres, et al. 1999 "Calculating correlated color temperatures across the entire gamut of daylight and skylight chromaticities" http://en.wikipedia.org/wiki/Color_temperature

## Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
xy2CCT.HernandezAndres(xyY[1],xyY[2])
```

---

`xy2CCT.McCamy` *convert from chromaticity coordinates to correlated color temperature*

---

## Description

`xy2CCT.McCamy` convert from chromaticity coordinates to correlated color temperature (approximation).

## Usage

```
xy2CCT.McCamy(x,y)
```

## Arguments

| | |
|---|---|
| x | x coordinates |
| y | y coordinates |

## Value

CCT McCamy

## Author(s)

Jose Gama

## Source

C. S. McCamy, 1992 "Correlated color temperature as an explicit function of chromaticity coordinates" Color Research & Application Volume 17, Issue 2, pages 142–144

## References

C. S. McCamy, 1992 "Correlated color temperature as an explicit function of chromaticity coordinates" Color Research & Application Volume 17, Issue 2, pages 142–144

## Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
xy2CCT.McCamy(xyY[1],xyY[2])
```

---

`xyChromaticitiesVos1978`
*x, y coordinates transformed to Judd (1951) x', y' system*

---

## Description

`xyChromaticitiesVos1978` x, y coordinates transformed to Judd (1951) x', y' system.

## Usage

```
xyChromaticitiesVos1978(x,y)
```

## Arguments

| | |
|---|---|
| x | x coordinate |
| y | y coordinate |

## Value

x', y' coordinates

## Author(s)

Jose Gama

## Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

## Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
xyChromaticitiesVos1978(xyY[1],xyY[2])
```

## xyY2XYZ *Convert CIE CMF to XYZ*

### Description

xyY2XYZ Converts CIE CMF to XYZ.

### Usage

```
xyY2XYZ(xyYmatrix)
```

### Arguments

| | |
|---|---|
| xyYmatrix | CIE CMFs |

### Value

XYZ coordinates

### Author(s)

Jose Gama

### Source

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### References

Logicol S.r.l., 2014 EasyRGB color search engine http://www.easyrgb.com/

### Examples

```
xyY2XYZ(c(0.310897, 0.306510, 74.613450))
```

## XYZ2BVR *convert from XYZ coordinates to BVR*

### Description

XYZ2BVR convert from XYZ coordinates to BVR.

### Usage

```
XYZ2BVR(XYZmatrix)
```

### Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |

### Value

BVR coordinates

### Author(s)

Jose Gama

### Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

### References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

### Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2BVR(XYZ)
```

---

## XYZ2CCT.Robertson *convert from chromaticity coordinates to correlated color temperature (Robertson)*

---

### Description

XYZ2CCT.Robertson convert from chromaticity coordinates to correlated color temperature (approximation) by Robertson.

### Usage

```
XYZ2CCT.Robertson(X, Y, Z)
```

### Arguments

| | |
|---|---|
| X | X coordinates |
| Y | Y coordinates |
| Z | Z coordinates |

### Value

CCT (Robertson)

### Author(s)

Jose Gama

### Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

### References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

### Examples

```
XYZ2CCT.Robertson( 0.11465380, 0.08391198, 0.08222077 )
```

---

## XYZ2HunterLab *convert from XYZ coordinates to Hunter Lab coordinates*

---

### Description

XYZ2HunterLab convert from XYZ coordinates to Hunter Lab coordinates.

### Usage

```
XYZ2HunterLab(XYZmatrix,illuminant='D65',observer=2,
RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

### Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |

### Value

Hunter Lab coordinates

### Author(s)

Jose Gama

### Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2HunterLab(XYZ)
```

---

XYZ2Lab *convert from XYZ coordinates to CIE Lab coordinates*

---

## Description

XYZ2Lab convert from XYZ coordinates to CIE Lab coordinates.

## Usage

```
XYZ2Lab(XYZmatrix,illuminant='D65',observer=2,
    RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |

## Value

CIE Lab coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
CIELMatrix<-XYZ2Lab(XYZ*100)
```

---

XYZ2LMS *Convert XYZ coordinates to LMS*

---

## Description

XYZ2LMS Converts XYZ coordinates to LMS.

## Usage

```
XYZ2LMS(XYZmatrix)
```

## Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |

## Value

LMS coordinates

## Author(s)

Jose Gama

## Source

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## References

Francoise Vienot, Hans Brettel,John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

## Examples

```
XYZ<-c(21.43162, -3.20673, 120.6259)
XYZ2LMS(XYZ)
```

XYZ2Luv *convert from XYZ coordinates to CIE Luv coordinates*

## Description

XYZ2Luv convert from XYZ coordinates to CIE Luv coordinates.

## Usage

```
XYZ2Luv(XYZmatrix,illuminant='D65',observer=2,
RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |

## Value

CIE Luv coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
CIELuvMatrix<-XYZ2Luv(XYZ*100)
```

XYZ2RGB *convert from XYZ coordinates to CIE RGB coordinates*

## Description

XYZ2RGB convert from XYZ coordinates to CIE RGB coordinates.

## Usage

```
XYZ2RGB(XYZmatrix, illuminant = "D65", observer = 2, RefWhite
                 = get("XYZperfectreflectingdiffuser", envir = environment()),
                 RGBModel = "sRGB", RefWhiteRGB = get("whitepointsRGB",
                 envir = environment()), gamma = NA,
                 RefWhiteIllum = get("XYZperfectreflectingdiffuser",
                 envir = environment()), CAT = "Bradford",
                 CATarray = get("ChromaticAdaptation", envir = environment()))
```

## Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |
| RGBModel | RGB model |
| RefWhiteRGB | white points for RGB model |
| gamma | gamma |
| RefWhiteIllum | Reference perfect reflecting diffuser |
| CAT | CAT |
| CATarray | Chromatic Adaptation |

## Value

CIE RGB coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2RGB(XYZ)
```

---

XYZ2RxRyRz *convert from XYZ to three filter measurements (reflectance factors)*

---

## Description

XYZ2RxRyRz convert from XYZ to three filter measurements (reflectance factors).

## Usage

```
XYZ2RxRyRz(XYZmatrix=NA,illuminant='C', observer=2,
RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

| | |
|---|---|
| XYZmatrix | XYZ matrix |
| illuminant | illuminant |
| observer | observer |
| RefWhite | White Reference |

## Value

CIE XYZ coordinates

## Author(s)

Jose Gama

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2RxRyRz(XYZ)
```

XYZ2xyY *convert from XYZ coordinates to xyY coordinates*

## Description

XYZ2xyY convert from XYZ coordinates to xyY coordinates.

## Usage

```
XYZ2xyY(XYZmatrix,illuminant='D65',observer=2,
RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |

## Value

xyY coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2xyY(XYZ)
```

XYZ2Yuv *convert from XYZ coordinates to Yuv coordinates*

## Description

XYZ2Yuv convert from XYZ coordinates to Yuv coordinates.

## Usage

```
XYZ2Yuv(XYZmatrix)
```

## Arguments

| | |
|---|---|
| XYZmatrix | XYZ coordinates |

## Value

Yuv coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2Yuv(XYZ)
```

XYZMoonSpencer1945 *Approximations from wavelengths to XYZ by Moon & Spencer*

## Description

XYZMoonSpencer1945 Approximations from wavelengths to XYZ by Moon & Spencer.

## Usage

```
XYZMoonSpencer1945(wavelen)
```

## Arguments

| | |
|---|---|
| wavelen | wavelenght data |

## Value

XYZ coordinates

## Author(s)

Jose Gama

## Source

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

## References

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

## Examples

```
XYZMoonSpencer1945(555)
```

XYZperfectreflectingdiffuser
*Perfect reflecting diffuser data*

## Description

XYZperfectreflectingdiffuser table with perfect reflecting diffuser data.

## Format

This data frame contains the following columns:

**Illuminant** Illuminant

**X2** CIE tristimulus X 2 deg observer

**Y2** CIE tristimulus Y 2 deg observer

**Z2** CIE tristimulus Z 2 deg observer

**X10** CIE tristimulus X 10 deg observer

**Y10** CIE tristimulus Y 10 deg observer

**Z10** CIE tristimulus Z 10 deg observer

## Author(s)

Jose Gama

## Source

Wyszecki, G. and Stiles, W.S., 1982 Color Science: Concepts and Methods, Quantitative data and formulae. John Wiley & Sons.

## References

Wyszecki, G. and Stiles, W.S., 1982 Color Science: Concepts and Methods, Quantitative data and formulae. John Wiley & Sons.

## Examples

```
data(XYZperfectreflectingdiffuser)
str(XYZperfectreflectingdiffuser)
```

XYZTannenbaum1974 *Approximations from wavelengths to XYZ by Tannenbaum 1974*

## Description

XYZTannenbaum1974 Approximations from wavelengths to XYZ by Tannenbaum 1974.

## Usage

```
XYZTannenbaum1974(wavelen)
```

## Arguments

| | |
|---|---|
| wavelen | wavelenght data |

## Value

XYZ coordinates

## Author(s)

Jose Gama

## Source

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

## References

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

## Examples

```
XYZTannenbaum1974(555)
```

XYZtoRGB *convert from XYZ coordinates to RGB*

## Description

XYZtoRGB convert from XYZ coordinates to RGB.

## Usage

```
XYZtoRGB(xc, yc, zc, ColorSystem = c(0.67, 0.33, 0.21, 0.71,
                0.14, 0.08, 0.31, 0.316))
```

## Arguments

| | |
|---|---|
| xc | XYZ X coordinates |
| yc | XYZ Y coordinates |
| zc | XYZ Z coordinates |
| ColorSystem | RGB Color System data |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
XYZtoRGB(0.11465380, 0.08391198, 0.08222077)
```

## Y2MunsellV *CIE XYZ "Y" to Munsell value*

### Description

Y2MunsellV CIE XYZ "Y" to Munsell value.

### Usage

```
Y2MunsellV(Y)
```

### Arguments

| | |
|---|---|
| Y | Y data |

### Value

Munsell value

### Author(s)

Jose Gama

### Source

ASTM, 2008 ASTM Standard D1535-08

### References

ASTM, 2008 ASTM Standard D1535-08

### Examples

```
Y2MunsellV(5)
```

## Y2MunsellVtable1D1535 *CIE XYZ "Y" to Munsell value formula, based on the ASTM Standard D1535-08*

### Description

Y2MunsellVtable1D1535 NLSQ regression for obtaining similar results to table 1 from ASTM Standard D1535-08.

### Usage

```
Y2MunsellVtable1D1535(Y)
```

### Arguments

| | |
|---|---|
| Y | Y data |

### Value

Munsell value

### Author(s)

Jose Gama

### Source

ASTM, 2008 ASTM Standard D1535-08

### References

ASTM, 2008 ASTM Standard D1535-08

### Examples

```
Y2MunsellVtable1D1535(5)
```

---

## YCbCr2RGB *Convert YCbCr coordinates to RGB*

---

### Description

YCbCr2RGB Converts YCbCr coordinates to RGB.

### Usage

```
YCbCr2RGB(YPbPrmatrix)
```

### Arguments

| | |
|---|---|
| YPbPrmatrix | YPbPr coordinates |

### Value

RGB coordinates

### Author(s)

Jose Gama

## Source

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## References

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## Examples

```
YCbCr2RGB(c(18165.831, -625.617, 6558.790))
```

---

# YIQ2RGB *Convert YIQ coordinates to RGB*

---

## Description

YIQ2RGB Converts YIQ coordinates to RGB.

## Usage

```
YIQ2RGB(YIQmatrix)
```

## Arguments

| | |
|---|---|
| YIQmatrix | YIQ coordinates |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## References

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## Examples

```
YIQ2RGB(c(82.949, 31.51965, 17.58261))
```

---

YPbPr2RGB *Convert YCbCr coordinates to RGB*

---

## Description

YPbPr2RGB Converts YCbCr coordinates to RGB.

## Usage

```
YPbPr2RGB(YPbPrmatrix)
```

## Arguments

| | |
|---|---|
| YPbPrmatrix | YPbPr coordinates |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Source

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## References

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 http://www.poynton.com/notes/colour_and_gamma/ColorFAQ.txt

## Examples

```
YPbPr2RGB(c(82.949000, -2.792896, 29.280320))
```

## Yuv2Luv *Convert Yuv coordinates to Luv*

### Description

Yuv2Luv Converts Yuv coordinates to Luv.

### Usage

```
Yuv2Luv(Yu.v.matrix, illuminant = "D65", observer = 2,
           RefWhite = get("XYZperfectreflectingdiffuser", envir = environment()))
```

### Arguments

| | |
|---|---|
| Yu.v.matrix | Yuv matrix |
| illuminant | illuminant |
| observer | observer |
| RefWhite | Reference White |

### Value

Luv coordinates

### Author(s)

Jose Gama

### Examples

```
Yuv <- c(0.08391198, 0.2830965, 0.4661789)
Yuv2Luv(Yuv)
```

## YUV2RGB *Convert YUV coordinates to RGB*

### Description

YUV2RGB Converts YUV coordinates to RGB.

### Usage

```
YUV2RGB(YUVmatrix)
```

### Arguments

| | |
|---|---|
| YUVmatrix | YUV coordinates |

## Value

RGB coordinates

## Author(s)

Jose Gama

## Examples

```
YUV2RGB(c(164.898, -5.584651, 58.53939))
```

---

Yuv2xy *convert from Yuv coordinates to xy coordinates*

---

## Description

Yuv2xy convert from Yuv coordinates to xy coordinates.

## Usage

```
Yuv2xy(Yu.v.matrix)
```

## Arguments

| | |
|---|---|
| Yu.v.matrix | Yuv coordinates |

## Value

xy coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
Yuv <- c(0.08391198, 0.2830965, 0.4661789)
Yuv2xy(Yuv)
```

Yuv2XYZ *convert from Yuv coordinates to XYZ coordinates*

## Description

Yuv2XYZ convert from Yuv coordinates to XYZ coordinates.

## Usage

```
Yuv2XYZ(Yu.v.matrix)
```

## Arguments

| | |
|---|---|
| Yu.v.matrix | Yuv coordinates |

## Value

XYZ coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
Yuv <- c(0.08391198, 0.2830965, 0.4661789)
Yuv2XYZ(Yuv)
```

Yxy2CIE1960UCS *convert from Yxy coordinates to CIE 1960 UCS*

## Description

Yxy2CIE1960UCS convert from Yxy coordinates to CIE 1960 UCS.

## Usage

```
Yxy2CIE1960UCS(Yxymatrix)
```

## Arguments

| | |
|---|---|
| Yxymatrix | Yxy coordinates |

## Value

CIE 1960 UCS

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
Yxy2CIE1960UCS(xyY[c(3,1,2)])
```

Yxy2Yuv *convert from Yxy coordinates to Yuv coordinates*

## Description

Yxy2Yuv convert from Yxy coordinates to Yuv coordinates.

## Usage

```
Yxy2Yuv(Yxymatrix)
```

## Arguments

| | |
|---|---|
| Yxymatrix | Yxy coordinates |

## Value

Yuv coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## References

Bruce Justin Lindbloom, 2014 http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html

## Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
Yxy2Yuv(xyY[c(3,1,2)])
```

# Index